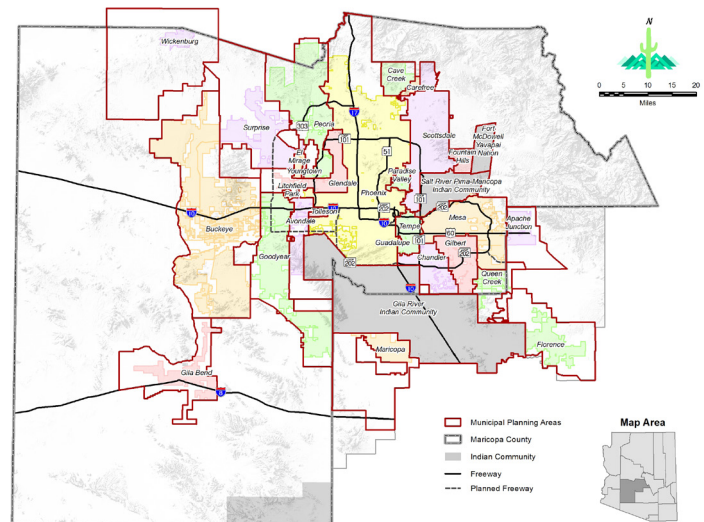


2024 Revision to the
2020 Edition

Uniform Standard Specifications and Details for Public Works Construction



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January 2024

NEW IN THE 2024 REVISION

Uniform Standard Specifications and Details for Public Works Construction—2024 Revision to the 2020 Edition

The MAG Standard Specifications and Details Committee, with assistance from specialized working groups, considered 13 cases during the 2023 session. Of these, 3 were carried forward, 1 withdrawn and 9 were approved and included in this revision.

Specifications rewritten, or with major updates:

- Section 355: Utility Potholes-Keyhole Method
- Section 725: Portland Cement Concrete

Specifications with minor updates:

- Section 101: Abbreviations and Definitions
- Section 102: Bidding Requirements and Conditions
- Section 107: Legal Regulations and Responsibility to Public
- Section 220: Riprap Construction
- Section 334: Preservative Seal for Asphalt Concrete
- Section 401: Traffic Control
- Section 605: Subdrainage
- Section 610: Water Line Construction
- Section 710: Asphalt Concrete

- Section 714: Micro-surfacing Materials
- Section 715: Slurry Seal Materials
- Section 718: Preservative Seal for Asphalt Concrete
- Section 771: Galvanizing

Other updates:

- Updated Table of Contents and Hyperlinks

Details that have been updated:

- Detail 100-1: INDEX (Page 1 of 3)
- Detail 100-2: INDEX (Page 2 of 3)
- Detail 100-3: INDEX (Page 3 of 3)
- Detail 212: UTILITY POTHOLE REPAIR
- Detail 552: FORD CROSSING AND CUT-OFF WALLS

Changes made in the 2023 Revision

Uniform Standard Specifications and Details for Public Works Construction—2023 Revision to the 2020 Edition

The MAG Standard Specifications and Details Committee, with assistance from specialized working groups, considered 17 cases during the 2022 session. Of these, 1 was carried forward and 16 were approved and included in this revision.

Specifications rewritten, or with major updates:

- Section 425: Topsoil
- Section 430: Landscaping
- Section 440: Landscape Irrigation
- Section 750: Ductile Iron Water Pipe and Fittings
- Section 757: Irrigation System Materials
- Section 795: Landscape Materials

- Section 759: Steel Pipe

Specifications that have been removed:

- Section 752: Asbestos-Cement Water Pipe

Other updates:

- Updated Table of Contents and Hyperlinks

Specifications with minor updates:

- Section 311: Placement and Construction of Cement Treated Subgrade
- Section 312: Cement Treated Base
- Section 615: Sanitary Sewer Line Construction
- Section 618: Storm Drain Construction
- Section 702: Base Materials
- Section 725: Portland Cement Concrete
- Section 738: High Density Polyethylene Pipe and Fittings for Storm Drain and Sanitary Sewer

Details that have been updated:

- Detail 100-1: INDEX (Page 1 of 3)
- Detail 100-2: INDEX (Page 2 of 3)
- Detail 120: SURVEY MARKER
- Detail 140: BOLLARD
- Detail 200-1: TRENCH BACKFILL AND SURFACE REPLACEMENT
- Detail 200-2: TRENCH BACKFILL AND SURFACE REPLACEMENT
- Detail 230: SIDEWALKS

Title VI Notice to the Public Maricopa Association of Governments

The Maricopa Association of Governments (MAG) hereby gives public notice that it is the policy of the agency to assure full compliance with Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, Executive Order 12898 on Environmental Justice, and related statutes and regulations in all programs and activities. Title VI requires that no person in the United States of America shall, on the basis of actual or perceived race, color, or national origin, be excluded from the participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which MAG receives federal financial assistance. Additional protections are provided in other federal and state statutes for discrimination based on religion, sex, disability, age, gender identity (as defined in paragraph 249(c)(4) of title 18, United States Code) or sexual orientation.

Any person who believes they have experienced discrimination under Title VI has a right to file a formal complaint with MAG. Any such complaint must be filed with MAG's Title VI Coordinator within 180 days following the date of the alleged discriminatory occurrence.

[Complaints should, at a minimum, include the following information:

- Your name and address, and a number at which you can be reached during business hours
- A general description of the person(s) injured by the alleged discriminatory acts
- A description of the alleged discriminatory act(s) in sufficient detail to enable the Title VI Coordinator to understand what occurred, when it occurred, and the basis of the alleged discrimination complaint (race, color, national origin, etc.)
- The letter must be signed and dated by the person filing the complaint or by someone authorized to do so on his or her behalf.]

For more information, or to file a complaint, please contact the Title VI Coordinator at (602) 254-6300.

Changes made in the 2023 Revision (continued)

- Detail 260: RETROFIT DRIVEWAY OR ALLEY ENTRANCE (WITH 2" ROLL CURB AND GUTTER)
- Detail 270: ROUND FRAME AND COVER (AND GRADE ADJUSTMENTS)
- Detail 271: SQUARE FRAME AND COVER (AND GRADE ADJUSTMENTS)
- Detail 391-1: VALVE BOX INSTALLATION AND GRADE ADJUSTMENT
- Detail 391-2: VALVE BOX INSTALLATION AND GRADE ADJUSTMENT
- Detail 392: DEBRIS CAP INSTALLATION
- Detail 420-1: CONCRETE SANITARY SEWER MANHOLE
- Detail 441: SEWER CLEANOUT
- Detail 534-4: CATCH BASIN TYPE 'E' (DETAILS)

New detail drawings:

- Detail 100-3: INDEX (Page 3 of 3)
- Detail 200-3: TRENCH BACKFILL AND SURFACE REPLACEMENT
- Detail 350: EXISTING WATER VALVE ABANDONMENT
- Detail 450: EXISTING MANHOLE ABANDONMENT
- Detail 601-1: DOUBLE STAKE TREE 5 GAL., 15 GAL., 24" BOX
- Detail 601-2: DUAL STAKE TREE ON SLOPE 5 GAL., 15 GAL., 24" BOX
- Detail 601-3: TRIPLE STAKE TREE 36" BOX OR GREATER
- Detail 601-4: MULTI-TRUNK TREE 24" BOX OR GREATER
- Detail 601-5: TREE STAKING AND GUYING (SINGLE TRUNK)
- Detail 601-6: TREE STAKING AND GUYING (MULTIPLE TRUNK)
- Detail 603-1: SHRUB PLANTING
- Detail 603-2: SHRUB PLANTING ON SLOPE
- Detail 603-3: GROUND COVER PLANTING
- Detail 603-4: VINE PLANTING
- Detail 603-5: SAGUARO PLANTING WITH WOOD BRACES
- Detail 603-6: OCOTILLO PLANTING CONTAINER STOCK
- Detail 603-7: AGAVE PLANTING BARE ROOT
- Detail 603-8: CACTUS/SUCCULENT PLANTING
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- Detail 603-9: PALM PLANTING BAREROOT
- Detail 607-1: DECOMPOSED GRANITE
- Detail 607-2: BOULDER INSTALLATION
- Detail 607-3: CONCRETE HEADER
- Detail 609-1: ROOT BARRIER
- Detail 611-1: BACKFLOW PREVENTER ASSEMBLY (2" DIA. & SMALLER)
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- Detail 613-3: QUICK COUPLER VALVE ASSEMBLY
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- Detail 613-7: PRESSURE REGULATOR ASSEMBLY
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- Detail 617-1: WIRE CONNECTOR
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Changes made in the 2022 Revision

Uniform Standard Specifications and Details for Public Works Construction—2022 Revision to the 2020 Edition

The MAG Standard Specifications and Details Committee, with assistance from specialized working groups, considered 15 cases during the 2021 session. Of these, 2 were carried forward and 13 were approved and included in this revision.

Specifications rewritten, or with major updates:

- Section 601: Trench Excavation, Backfilling and Compaction
- Section 611: Water, Sewer and Storm Drain Testing
- Section 776: Masonry Mortar and Grout
- Detail 422-2: MANHOLE FRAME AND COVER ADJUSTMENT - TYPE 'B'
- Detail 542-1: CURB OPENING CATCH BASIN WITH SIDEWALK (3' - 17' WING) TYPE 'I'
- Detail 542-2: CURB OPENING CATCH BASIN WITHOUT SIDEWALK (3' - 17' WING) TYPE 'I'

Specifications with minor updates:

- Section 101: Abbreviations and Definitions
- Section 415: Flexible Metal Guardrail
- Section 430: Landscaping and Planting

Other updates:

- Updated Table of Contents and Hyperlinks

New detail drawings:

- Detail 226-1: CURB CUT TYPE 1
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- Detail 272: RETROFIT MANHOLE/VALVE BOX CURB REALIGNMENT
- Details that have been updated:
 - Detail 100-1: INDEX (Page 1 of 2)
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 - Detail 110-2: PLAN SYMBOLS (LINE TYPES)
 - Detail 212: UTILITY POTHOLE REPAIR
 - Detail 321: STANDARD WATER METER VAULT
 - Detail 419-2: PRE-CAST POLYMER CONCRETE MANHOLE BASE
 - Detail 420-2: PRE-CAST CONCRETE MANHOLE BASE
 - Detail 422-1: MANHOLE FRAME AND COVER ADJUSTMENT - TYPE 'A'

Changes made in the 2021 Revision

Uniform Standard Specifications and Details for Public Works Construction—2021 Revision to the 2020 Edition

The MAG Standard Specifications and Details Committee, with assistance from specialized working groups, considered 8 cases during the 2020 session. Of these, 1 was withdrawn and 7 were approved and included in this revision.

New Specifications:

- Section 303: Pervious Concrete Base Coarse
- Section 626: Corrosion Coating of Sanitary Sewer Manholes

Specifications rewritten, or with major updates:

- Section 360: Telecommunications Installation
- Section 611: Water, Sewer and Storm Drain Testing

Specifications with minor updates:

- Section 323: Placement of Pervious Concrete
- Section 345: Adjusting Frames, Covers And Valve Boxes
- Section 620: Cast-In-Place Concrete Pipe
- Section 621: Corrugated Metal Pipe And Arches
- Section 714: Microsurfacing Materials
- Section 715: Slurry Seal Materials
- Section 725: Portland Cement Concrete
- Section 787: Gray Iron Castings

Other updates:

- Updated Table of Contents, Index, and Hyperlinks

New detail drawings:

- Detail 228: PERVIOUS CONCRETE PAVEMENT

Details that have been updated:

- Detail 100-1: INDEX (Page 1 of 2)
- Detail 100-2: INDEX (Page 2 of 2)
- Detail 220-1: CURB AND GUTTER TYPES A, B, C, AND D
- Detail 251: RETURN TYPE DRIVEWAYS
- Detail 393: WATER VALVE EXTENSION
- Detail 505: CONCRETE COLLAR FOR PIPE
- Detail 550: SPILLWAY INLET AND OUTLET

Changes made in the 2020 Edition

Uniform Standard Specifications and Details for Public Works Construction—2020 Edition

The MAG Standard Specifications and Details Committee, with assistance from specialized working groups, considered 15 cases during the 2019 session. Of these, 11 were approved and included in this revision. These changes are summarized in the list below. This edition also includes all the updates since the 2015 Edition as listed on the following pages. Finally, the 2020 Edition includes numerous non-content related corrections throughout including: typographic, spelling, hyperlinking, and formatting.

New Specifications:

- Section 627: Painting Sanitary Sewer Manholes with Insecticide
- Section 744: Precast Polymer Concrete Manhole

Specifications rewritten, or with major updates:

- Section 331: Placement and Construction of Asphalt Emulsion Micro-Surfacing Treatments
- Section 332: Placement and Construction of Asphalt Emulsion Slurry Seal Treatments
- Section 713: Emulsified Asphalts Materials
- Section 714: Microsurfacing Materials
- Section 715: Slurry Seal Materials

Specifications with minor updates:

- Section 206: Structure Excavation and Backfill
- Section 321: Placement and Construction of Asphalt Concrete Pavement
- Section 525: Pneumatically Placed Mortar
- Section 618: Storm Drain Construction
- Section 625: Manhole Construction and Drop Sewer Connections
- Section 631: Water Taps and Meter Service Connections
- Section 719: Polymer Modified Asphalt Concrete

Other updates:

- Updated Table of Contents, Index, and Hyperlinks

New detail drawings:

- Detail 238-4: SINGLE CURB RAMP MID-BLOCK RESIDENTIAL STREET W/4" ROLL CURB
- Detail 419-1: POLYMER CONCRETE SANITARY SEWER MANHOLE

- Detail 419-2: PRE-CAST POLYMER CONCRETE MANHOLE BASE
- Detail 419-3: POLYMER CONCRETE MANHOLE BASE

Details that have been updated:

- Detail 100-1: INDEX (PAGE 1 OF 2)
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- Detail 145: SAFETY RAIL
- Detail 200-1: TRENCH BACKFILL AND SURFACE REPLACEMENT
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- Detail 262: WING TYPE ALLEY ENTRANCE (W/ COMBINED CURB & GUTTER)
- Detail 404-1: WATER AND SANITARY SEWER SEPARATION/PROTECTION
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- Detail 423-1: 24" CAST IRON MANHOLE FRAME AND COVER
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- Detail 501-1: HEADWALL
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- Detail 501-4: HEADWALL IRRIGATION 18" TO 60" PIPE
- Detail 501-5: HEADWALL DROP INLET
- Detail 502-1: TRASH RACK

**STANDARD
SPECIFICATIONS
for
PUBLIC WORKS
CONSTRUCTION**

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**2024 Revision to the
2020 Edition**

ARIZONA

FOREWORD

Publication of these Uniform Standard Specifications and Details for Public Works Construction fulfills the goal of a group of agencies who joined forces in 1966 to produce such a set of documents. Subsequently, in the interest of promoting countywide acceptance and use of these standards and details, the Maricopa Association of Governments accepted their sponsorship and the responsibility of keeping them current and viable.

These specifications and details, representing the best professional thinking of representatives of several Public Works Departments, reviewed and refined by members of the construction industry, were written to fulfill the need for uniform rules governing public works construction performed for Maricopa County and the various cities and public agencies within Maricopa County who could not afford to promulgate such standards for themselves. Agencies in other regions or climes that desire to use these specifications may need to make adjustments for local conditions.

A uniform set of specifications and details, updated and embracing the most modern materials and construction techniques will reduce conflicts, provide clarity and lower construction costs for the benefit of the public.

Use of these standards for projects outside of the right-of-way should be reviewed by professional engineers and architects and applied with care to insure relevance to the planned work.

Specifications and details should be incorporated into project plans and specifications after careful review by the design engineer or architect of specific project needs. Not all specifications contained herein will apply to all projects. Prepared plans and specifications should clearly call out only those specific uniform specifications and details required for the project.

Uniform specifications and details are not a substitute for good engineering judgment. Unique conditions will arise that are outside the scope of these standards. When this happens, professional engineers and architects are required to use their judgment to amend these standards to best meet site-specific project needs in accordance with the rules set forth by the State of Arizona and policy statements made by the Arizona State Board of Technical Registration.

The Uniform Standard Specifications and Details for Public Works Construction are revised periodically and reprinted to reflect the changing technology of the construction industry. To this end a Specifications and Details Committee has been established as a permanent organization to continually study and recommend changes to the Specifications and Details. Interested parties may address suggested changes and questions to:

Standard Specifications & Details Committee
c/o Maricopa Association of Governments
302 North First Avenue, Suite 300
Phoenix, Arizona, 85003

Suggestions will be reviewed by the committee and appropriate segments of the construction industry and revisions will be published the first of each year. A copy of this publication is available for review on the internet at the website listed below. Please follow the links to the publications page and look for *Uniform Standard Specifications for Public Works Construction* and/or *Uniform Standard Details for Public Works Construction*.

www.azmag.gov

In the interest of regional uniformity, it is hoped that all using agencies will adopt these standards with minimal changes. It is recognized that because of charter requirements and for other reasons, some agencies will find it necessary to modify or supplement certain requirements. In the interest of regional uniformity, it is strongly recommended that using agencies bring desired modifications to the MAG Committee for consideration and inclusion into these standards.

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SECTION 101

Calendar Day: Every day shown on the calendar.

Call for Bids: The standard forms inviting proposals or bids.

“Careful and prudent manner”: means conducting excavation in such a way that when it approaches within twenty-four inches of the underground facility located and marked by the owner or operator, by stakes, paint or in some customary manner, the exact location is manually determined, and the uncovered facility is supported and protected.

Change Order: A written order issued by the Engineer to the Contractor to make changes in the work or to perform extra work, and setting forth conditions for payment and/or adjustment in time of completion.

City: A municipal corporation, organized and existing under and by virtue of the laws of the State of Arizona.

City/County Clerk: The duly authorized person who performs the duties of clerk for the Contracting Agency.

Completion Time: The number of calendar days for completion of an act, including authorized time extensions. In case a calendar date of completion is shown in the proposal in lieu of the number of calendar days, the contract shall be completed by that date. The time within which an act is to be done shall be computed by excluding the first and including the last day; and if the last day be Sunday or a legal holiday, that shall be excluded.

Conflicting Utility: An existing utility, shown or not shown on the plans is conflicting when any part of the utility falls within the dimensions of the new installation, such that it would be in physical contact with the new installation.

Construction Project: The erection, installation, remodeling, alteration, of durable facilities upon, under, or over the ground. This shall include, but is not limited to buildings, roadways and utility pipes, lines, poles or other structures.

Contingent Bid Item: This is a minor bid item, which is likely, but not certain, to occur during the course of work. If the Engineer determines that this work is required, the Contractor will accomplish the work and payment will be made based on the contingent unit bid price included in the proposal. Since the quantity listed in the proposal is primarily for bid comparison, the amount of work required by the Engineer may vary materially from this.

Contract: The written instrument executed by the Contractor and the Contracting Agency by which the Contractor is bound to furnish all labor, equipment, and materials and to perform the work specified, and by which the Contracting Agency is obligated to compensate the Contractor therefore at the prices set forth therein. The Contract Documents are herewith by reference made a part of the contract as if fully set forth therein.

Contract Documents: All the integral documents of the contract, including but not limited to, Call for Bids, Plans, Standard Specifications and Details, Special Provisions, Proposal, Addenda, Performance Bond, Payment Bond, Certificates of Insurance, Ordinance, Contract, and Change Orders.

Contracting Agency: The legal entity that has contracted for the performance of the work or for whom the work is being performed.

Contractor: The individual, firm, partnership, corporation or combination thereof entering into a contract with the Contracting Agency to perform the advertised work.

Coal Ash: Fly ash and bottom ash resulting from the process of combustion of ground or powdered coal obtained either from current power plant production or harvested from landfills or impoundments. This definition of coal ash does not include, among other things, the residue resulting from: (1) fluidized bed combustion, (2) the burning of municipal solid waste or any other refuse with coal, or (3) the burning of industrial or municipal solid waste in incinerators.

Council: The City Council, which by law constitutes the Legislative Department of the City.

County: Maricopa County, organized and existing under and by virtue of the laws of the State of Arizona.

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Culvert: Any structure not classified as a bridge, which provides an opening under or adjacent to the roadway.

Days: Unless otherwise designated, days will be understood to mean calendar days.

Deflection: The amount the certified mean inside diameter (CMID) of pipe has reduced under load, as applied to thermoplastic pipe. Deflection is expressed as a percentage reduction in the CMID.

Emergency: Unforeseen occurrences and combinations of circumstances involving the public welfare or the protection of work already done under the Contract Documents, or which endanger life or property and call for immediate action or remedy.

Engineer: The person, appointed as City or County Engineer by the Council or the Board of Supervisors, acting directly or through his duly authorized representative.

Equipment: (Construction) — All machinery and equipment, together with the necessary supplies for upkeep and maintenance, and also tools and apparatus necessary for the proper construction and acceptable completion of work. (Installed) — All material or articles used in equipping a facility as furnishings or apparatus to fulfill a functional design.

Extra Work: An item of work not provided for in the contract as awarded but found essential to the satisfactory completion of the contract within its intended scope.

Final Backfill: The material placed in a trench above the initial backfill to the top of the trench or to the bottom of the road base material.

Flooding: Flooding will consist of the inundation of the entire lift with water, puddle with poles or bars to insure saturation of the entire lift.

Fly Ash: Finely divided residue that results from the process of combustion of ground or powdered coal and that is transported by flue gases.

Force Account Work: Work done by personnel of the Contracting Agency as in-house work.

Foundation: For buildings or structures, this will be the substructure. For a trench, the foundation is the bottom of the required trench excavation. The foundation surface is either native material, or replacement material when unsuitable material occurs, and is removed and replaced at the bottom of the required trench excavation.

Full Depth Pavement: An asphalt concrete pavement structure in which the granular base and subbase are replaced by proportionate thicknesses of asphalt concrete.

Haunching: The area of a pipe trench between the bottom of the pipe and the springline of the pipe.

Improvement District Project: A project financed by assessments against the property included in a special assessment district authorized under, or implemented by an act of the legislature of the State and/or a procedural ordinance of the City or County.

Initial Backfill: The material placed in a trench between the springline and 12 inches above the crown of the conduit.

Inspector: The Engineer's authorized representative assigned to make detailed inspections of contract performance.

Jetting: Jetting is the densification of material, using a continuous supply of water, under pressure, transmitted to the material through a rigid pipe of sufficient length to reach the bottom of the lift being densified. In all cases, the entire lift will be completely saturated working from the top to the bottom.

Laboratory: The established materials testing laboratory of the Contracting Agency's Engineering Department, or other laboratories acceptable to and/or authorized by the Engineer to test materials and work involved in the Contract.

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Major Item: A major item shall be the total of any item of work and/or materials specified in the bid schedule that exceeds the amount established in Table [109-1](#).

Materials: Any substance specified in the project, equipment and other material used or consumed in the performance of the work.

Median: The portion of a divided highway separating the roadways used by traffic going in opposite directions.

Non Pay Item: An item of work for which no separate payment will be made under the proposal, but which must be included as an incidental cost for payment on an associated item included in the proposal.

Notice of Award: A letter from the City or County Clerk advising the Contractor that he is the successful bidder and the Council or Board of Supervisors has accepted his proposal.

Notice to Proceed: A directive issued by the Engineer, authorizing the Contractor to start the work or improvements required in the Contract.

Obligee: One to whom another is obligated.

Open Trench: The excavated area shall be considered as open trench until all the aggregate base course for pavement replacement has been placed and compacted or, if outside of a pavement area, until the excavated area is brought to finish grade or natural grade.

Owner: The City or County, acting through its legally constituted officials, officers or employees.

Pavement: Any surfacing of streets, alleys, sidewalks, courts, driveways, etc., consisting of mineral aggregate bound into a rigid or semi-rigid mass by a suitable binder such as, but not limited to, Portland cement or asphalt cement.

Pavement Structure: The combination of subbase, base course, and surface course placed on a subgrade to support the traffic load and distribute it to the roadbed.

Pay Item: A detail of work for which separate payments are to be made under the Contract, as specified in the proposal.

Payment Bond: The security provided by the Contractor solely for the protection of claimants, supplying labor and materials to the Contractor or his Subcontractors.

Performance Bond: The security provided by the Contractor solely for the protection of the Contracting Agency and conditioned upon the faithful performance of the contract in accordance with the plans, specifications and conditions thereof.

Permit: The license to do construction in public rights-of-way and/or easements; issued by an Agency to a Contractor working for another party.

Pipe Embedment Zone: The area of a trench consisting of the bedding, haunching, and initial backfill areas.

Plans: All approved drawings or reproductions thereof pertaining to the work and details therefore, which are made a part of the Contract Documents.

Plant: The Contractor's and/or subcontractor's facilities, including but not limited to small tools and mobile equipment, located on and/or offsite, necessary for preparation of materials and prosecution of work for the project.

Principal: The individual, firm or corporation primarily liable on an obligation, as distinguished from a surety.

Professional Engineer: A person who has a current engineering registration granted by the Arizona State Board of Technical Registration in one or more branches of engineering recognized by the board.

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Profile Grade: The trace of a vertical plan intersecting the top surface of the proposed wearing surface, usually along the longitudinal centerline of the roadbed. Profile grade means either elevation or gradient of such trace according to the context.

Project: A specific coordinated construction or similar undertaking identified by a single project number and bid and awarded as one contract. On occasion two or more projects may be bid and awarded as a single contract.

Proposal: The offer of a bidder on the prescribed form, to perform the work and to furnish the labor and materials at the prices quoted.

Proposal Form: The approved form on which the Contracting Agency requires bids to be prepared and submitted for the work.

Proposal Guarantee: The security furnished with a bid to guarantee that the bidder will enter into the contract if his bid is accepted.

Proposal Pamphlet: The book or pamphlet pertaining to a specific project, containing proposal forms, special provisions and other information necessary for and pertinent to the preparation of the proposal or bid.

Referred Documents: On all work authorized by the Contracting Agency, any referenced documents in the specification, i.e., Bulletins, Standards, Rules, Methods of Analysis or test. Codes and Specifications of other Agencies, Engineering Societies or Industrial Associations, refer to the Latest Edition thereof, including Amendments, which are in effect and published at the time of Advertising for Bids or the issuing of a permit for the work, unless otherwise stated.

Right-of-way: A general term denoting land, property, or interest therein, usually in a strip acquired for or devoted to a street, highway, or other public improvement.

Road: A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

Roadside: A general term denoting the area adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway may also be considered roadside.

Roadside Development: Those items necessary to the complete roadway which provide for the preservation of landscape materials and features; the rehabilitation and protection against erosion of all areas disturbed by construction through seeding, sodding, mulching and the placing of other ground covers; such suitable planting and other improvements as may increase the effectiveness and enhance the appearance of the roadway.

Roadway: The portion of the right-of-way intended primarily for vehicular traffic, and including all appurtenant structures and other features necessary for proper drainage and protection. Where curbs exist, it is that portion of roadway between the faces of the curbs.

Sewers: Conduits and related appurtenances employed to collect and carry off water and waste matter to a suitable point of final discharge.

Shop Drawings: Drawings or reproduction of drawings, detailing; fabrication and erection of structural elements, falsework and forming for structures, fabrication of reinforcing steel, installed equipment and installation of systems, or any other supplementary plans or similar data, which the Contractor is required to submit for approval.

Shoulder: The portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

Sidewalk: That portion of the roadway primarily constructed for the use of pedestrians.

Special Provisions: The special conditions, requirements, additions, and/or revisions to the Standard Specifications, applicable to the work, to cover conditions or requirements peculiar to the project under consideration.

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Specifications: The descriptions, directions, provisions, and requirement for performing the work as contained in the Contract Documents.

Standard Details: Uniform detail drawings of structures or devices adopted as Standard Details by the Engineer.

Standard Specifications: Uniform general specifications adopted as Standard Specifications by the Engineer.

Springline: The vertical location having a maximum horizontal dimension or in box sections, the mid-height of the vertical wall.

Storm Drain: Any conduit and appurtenance intended for the reception and transfer of storm water.

Street: Streets, avenues, alleys, highways, crossings, lanes, intersections, courts, places, and grounds now open or dedicated or hereafter opened or dedicated to public use and public ways.

Structures: Bridges, culverts, catch basins, drop inlets, retaining walls, cribbing, manholes, end walls, sewers, service pipes underdrains foundation drains, fences, swimming pools, and other features which may be encountered in the work and not otherwise classed herein.

Subbase: The lower course of the base of a roadway, immediately above the subgrade.

Subcontractors: Those having direct contracts with the Contractor and those who furnish material worked into a special design according to the Plans and Specifications for the work, but not those who merely furnish material not so worked.

Subgrade: The supporting structures on which the pavement and its special undercourses rest.

Substructure: All of that part of the structure or building below the bearings of simple and continuous spans, skewbacks of arches and tops of footings of rigid frames, together with the backwalls, wingwalls and wing protection railings.

Superintendent: The Contractor's authorized representative in responsible charge of the work.

Superintendent of Streets: The person duly appointed by the Council of the Contracting Agency, as provided by the Arizona Revised Statutes.

Superpave Mix: Asphalt mix in compliance with the Gyration Mix design requirements of Section [710.3.2.2](#).

Superstructure: The entire structure or building except the substructure.

Supplemental Specifications: Additions and revisions to the Standard Specifications that are adopted subsequent to issuance of the printed book.

Supplementary General Conditions: Requirements, or revisions, to the Standard General Conditions, applicable to the work, and to cover conditions or requirements peculiar to the project under consideration.

Surety: The individual, firm or corporation, bound with and for the Contractor for the acceptable performance, execution, and completion of the work, and for the satisfaction of all obligations incurred.

Surface Course: The finished or wearing course of an asphalt concrete pavement structure.

Thermoplastic: A material, usually a plastic polymer, which becomes more soft when heated and hard when cooled, used in the production of various pipe products including high-density polyethylene (HDPE), polypropylene (PP), polyvinyl chloride (PVC) and steel-reinforced polyethylene (SRPE) pipes.

Title or Headings: The titles or headings of the sections and subsections herein are intended for convenience of reference and shall not be considered as having any bearing on their interpretation.

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Township, City, Town or District: A subdivision of the County used to designate or identify the location of the proposed work.

Traveled Way: The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

“Underground Facility”: means any item which shall be buried or placed below ground for use in connection with the storage or conveyance of water, sewage, electronic, telephone or telegraphic communications, electric energy, oil, gas or other substances, and shall include, but not be limited to pipes, sewers, conduits, cables, valves, lines, wires, manholes, attachments and those portions of poles and their attachments below ground.

Utility: Pipe lines, conduits, ducts, transmission lines, overhead or underground wires, railroads, storm drains, sanitary sewers, irrigation facilities, street lighting, traffic signals, and fire alarm systems, and appurtenances of public utilities and those of private industry, businesses or individuals solely for their own use or use of their customers which are operated or maintained in, on, under, over or across public right-of-way or public or private easement.

Waterworks (Water Supply System): The reservoirs, pipe lines, wells, pumping equipment, purification works, mains, service pipes, and all related appliances and appurtenances utilized in the procurement, transportation and delivery of an adequate, safe, and palatable water supply for the Contracting Agency.

Work: Any or all of the improvements mentioned and authorized to be made, and the construction, demolition, reconstruction, and repair of all or any portion of such improvements, and all labor, services, incidental expenses, and material necessary or incidental thereto.

Working Day: A calendar day, exclusive of Saturdays, Sundays, and Contracting Agency recognized legal holidays, on which weather and other conditions not under the control of the Contractor will permit construction operations to proceed for the major part of the day with the normal working force engaged in performing the controlling item or items of work, which would be in progress at that time.

101.3: In order to avoid cumbersome and confusing repetition of expressions in these specifications, it is provided that whenever anything is, or is to be, done, if, as, or, when, or where contemplated required, determined, directed, specified, authorized, ordered, given, designated, indicated, considered necessary, deemed necessary, permitted, reserved, suspended, established, approval, approved, disapproved, acceptable, unacceptable, suitable, accepted, satisfactory, unsatisfactory, sufficient, insufficient, rejected, or condemned, it shall be understood as if the expression were followed by the words by the Engineer or to the Engineer.

- End of Section -

SECTION 102

not be executed by an individual surety or sureties. In addition, said company or companies shall be rated “Best A-” or better as required by the Contracting Agency, as currently listed in the most recent Best Key Guide, published by the A.M. Best Company.

102.9 SUBMISSION OF PROPOSAL:

The proposal and proposal guarantee shall be submitted in a sealed envelope. The outside, lower right-hand corner of which shall be marked as follows:

Bid of _____, Contractor
For _____
_____ Project No. _____ Contracting Agency

Envelopes shall be mailed or delivered to the office of the Contracting Agency, and must be received before the time and date specified in the Call for Bids or any Addenda.

Proposals received after the time and date specified will be returned, unopened, to the bidder.

102.10 WITHDRAWAL OR REVISION OF PROPOSAL:

Any bidder may withdraw or revise a proposal after it has been deposited with the Contracting Agency, provided his request is received by the Contracting Agency, in writing, before the time specified for opening proposals or as stipulated herein.

102.11 PUBLIC OPENING OF PROPOSALS:

Proposals will be opened and read publicly at the time and place specified in the Call for Bids or any Addenda. Bidders, their authorized agents and other interested parties are invited to be present.

When proposals for more than one project are to be opened at the same time, any bidder may, after the time set for the opening proposals, request to withdraw his second or succeeding proposal prior to the opening of proposals for that project. Should this occur, there will be a brief delay in the opening of proposals to permit the bidder to submit his request. Upon receipt of the bidder’s written request, by the Contracting Agency, his proposal will be returned unopened.

102.12 DISQUALIFICATION OF BIDDERS:

Either of the following reasons may be considered as being sufficient for the disqualification of a bidder and the rejection of his proposal:

- (A) Receipt of more than one proposal for the same work from an individual, partnership or corporation under the same or different names.
- (B) Evidence of collusion among bidders or assistance from any officer of the Contracting Agency, or of any Department thereof.

102.13 SUCCESSFUL BIDDERS:

Unless otherwise specified in the proposal pamphlet, the successful bidder may obtain seven (7) sets of plans and special provisions, for the project from the Contracting Agency, at no cost.

- End of Section -

SECTION 103

AWARD AND EXECUTION OF CONTRACT

103.1 CONSIDERATION OF PROPOSALS:

After the proposals, for the contemplated work, have been opened and read as provided in these specifications, the respective totals will be checked and compared by the Contracting Agency. The basis of comparison will be to verify the accuracy of the total proposal by checking the extensions and additions. In the event of a discrepancy, in the amount bid for a pay item, the unit bid price will govern unless obviously in error. The results of such comparison will be considered public information.

The right is reserved to award the contract to the lowest and/or best responsible bidder, or to reject all proposals and to re-advertise for any reason the Contracting Agency determines.

In case all proposals are rejected, any subsequent changes, additions, addenda, or new sets of plans and special provisions will be provided to all purchasers of the first issue of the plans and special provisions at no additional charge, except that out-of-town bidders will pay shipping charges.

103.2 RETURN OF PROPOSAL GUARANTEE:

All proposal guarantees, except those of: the two lowest responsible bidders on Bond Issue and Budget Projects; the lowest responsible bidder or the lowest responsible bidders of alternative plans and specifications on Improvement District Projects, will be returned immediately following the opening and checking of proposals. The retained proposal guarantee or guarantees will be returned immediately after the contract documents have been executed by all parties.

103.3 AWARD OF CONTRACT:

The Contracting Agency, through its duly authorized body or agent will award the contract to the lowest and/or best responsible bidder, or all proposals will be rejected, as soon as practicable after the date of opening proposals.

No proposal shall be withdrawn for a period of 50 days after opening without consent of the Contracting Agency through the body or agent duly authorized to accept or reject the proposal except that in the case of Federally-assisted projects, or other projects award of which is conditioned on the approval of an agency not under the control of the Contracting Agency, withdrawal shall be made within a period of 50 days after opening without such consent.

If written notice of the acceptance of a proposal is delivered to the successful bidder within the times noted above, or at any time thereafter before such proposal has been withdrawn, the bidder shall execute and deliver a contract in the prescribed form, within 10 days after receipt of such notice or his proposal guarantee shall be forfeited as provided elsewhere herein. Concurrently with the contract, the Contractor shall submit all documentation required to enable the agency to execute the contract.

The successful bidder will be furnished a Notice of Award on:

- (A) Bond Issue or Budget Projects by letter, to the address shown on the proposal.
- (B) Improvement District Projects by publication in accordance with the requirements of Arizona Revised Statutes, Section 9-681.

103.4 CANCELLATION OF AWARD:

The Contracting Agency reserves the right to cancel the award of any contract at any time before the execution of said contract by all parties, without any liability against the Contracting Agency.

103.5 REQUIREMENT OF CONTRACT BONDS:

Concurrently with the submittal of the contract, the Contractor shall furnish the Contracting Agency the following bonds, which shall become binding upon the award of the contract to the Contractor.

SECTION 106

- (G) The submittal, for purposes of review, number of copies, etc., shall follow the procedures as outlined in Section [105.2](#), except in the case of response time. If the Engineer does not respond in a timely manner, which in turn, impacts the substitution, the Contractor shall continue to perform the work in accordance with the contract and the substitution will be considered rejected. In addition, no adjustment in the contract time will be granted for nonacceptance of the substitution.
- (H) There will be no additional costs to the Contracting Agency for the substitution. If the substitution yields a net savings in the contract price, the amount of savings shall be divided between the Contracting Agency and the Contractor in a percentage established by the Contracting Agency.
- (I) If the substitution is accepted and an adjustment in the contract cost and/or contract time is in order, a change order will be issued to the Contractor for the changes.

106.5 STORAGE OF MATERIALS:

The Contractor shall provide storage facilities and exercise such measures as will insure the preservation of the quality and fitness of all materials and/or equipment to be used in the work. Stored materials and/or equipment, even though approved before storage, may again be inspected prior to their use in the work. Stored items shall be located so as to facilitate their prompt inspection. That portion of the right-of-way and easements not required for public travel may be used for storage purposes, when approved by the Engineer. Any additional storage area as required must be provided by the Contractor. Private property shall not be used for storage purposes without written permission of the owner or lessee. If requested, by the Engineer, copies of such written permission shall be made available.

106.6 HANDLING MATERIALS:

All materials and/or equipment shall be handled in such a manner as to preserve their quality and fitness for the work.

106.7 UNACCEPTABLE MATERIALS:

All materials and/or equipment not conforming to the requirements of the specifications, whether in place or not, may be rejected. Rejected materials and/or equipment shall be removed immediately from the site of work unless otherwise permitted by the Engineer. No rejected material and/or equipment, the defects of which have been subsequently corrected, shall be used until approved in writing by the Engineer.

106.8 FURNISHED MATERIALS:

Materials and/or equipment, furnished by the Contracting Agency, will be delivered or made available to the Contractor as indicated in the special provisions. The cost of handling and placing shall be considered as included in the contract price for the pay item with which they are used.

The Contractor will be held responsible for all materials and/or equipment accepted by him and will make good any shortages, deficiencies and damages, which may occur after such acceptance.

- End of Section -

SECTION 107

LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

107.1 COMPLIANCE WITH LAWS:

The Contractor shall keep fully informed of, observe and comply with all Federal and State laws, County and City ordinances, regulations, codes and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any way affect the conduct of the work. The Contractor warrants that all items supplied and work performed under the contract have been sold, produced, delivered and furnished in strict compliance with all such laws, ordinances, regulations, codes, orders and decrees to which the items, work and Contractor are subject. Upon request, Contractor shall execute and deliver to the Agency such documents as may be required by the Agency to evidence compliance with such laws, ordinances, regulations, codes, orders and decrees. The Contractor shall protect and indemnify the Contracting Agency and its representatives against any claim or liability arising from or based on the violation of such, whether by the Contractor or the Contractor's employees.

107.2 PERMITS:

Permits, bonding and insurance requirements shall be as required by statutes, codes, ordinances or regulations.

The Public Agency, when acting as the Contracting Agency, may obtain some of the required permits. It is the duty of the Contractor to determine that all necessary permits have been obtained. The Contractor shall, at the Contractor's own expense, obtain all the required permits, which have not been furnished. The Contractor shall comply with all permit requirements until the Contract is completed or the permit is closed-out or transferred. The Contractor shall be responsible to close out all permits except those authorized by special provision to be transferred.

In all cases, the Contractor or the person supervising the authorized work shall notify the appropriate permit agency so as to insure proper inspection by the agency concerned.

107.3 PATENTED DEVICES, MATERIALS AND PROCESSES:

If the Contractor employs any design, device, material, or process covered by letters of patent or copyright, he shall provide for such use by suitable legal agreement with the patentee or owner. The Contractor and the surety shall indemnify and save harmless the Contracting Agency, any affected third party or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Contracting Agency for any costs, expenses, and damages which it may be obligated to pay by reason of any infringement, at any time during the prosecution or after the completion of the work.

107.4 REPORTING ARCHAEOLOGICAL DISCOVERIES:

Attention is directed to Sections 41-844 and 41-865 Arizona Revised Statutes. In view of the above, it shall be a provision of every contract that when archaeological features are encountered or unearthed in the excavation of material pits or of the roadway prism, or other excavation, the Contractor shall report promptly to the Director of the Arizona State Museum and the Contracting Agency. The Contractor will be allowed extra time as appropriate in accordance with the provisions of Section [108](#).

107.5 SAFETY, HEALTH AND SANITATION PROVISIONS:

The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his employees as may be necessary to comply with the requirements and regulations of the Arizona State Department of Health or as specified by the Maricopa County Health Department, Sanitary Code.

The Contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions, on his own responsibility or as the Engineer may determine, reasonably necessary to protect the life and the health of employees on the job, the safety of the public and to protect property in connection with the performance of the work covered by the contract.

PART 200
EARTHWORK

Section	Last Revised	Title	Page
201	1999	<u>Clearing and Grubbing</u>	201-1
205	1998	<u>Roadway Excavation</u>	205-1
206	2020	<u>Structure Excavation and Backfill</u>	206-1
210	2009	<u>Borrow Excavation</u>	210-1
211	2015	<u>Fill Construction</u>	211-1
215	1998	<u>Earthwork for Open Channels</u>	215-1
220	2024	<u>Riprap Construction</u>	220-1
230	2010	<u>Dust Palliative Application</u>	230-1

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SECTION 220

stones shall depress below the finished grades no lower than a distance equal to 1/2 of the nominal D₅₀ size. Special care shall be exercised in placing riprap within 3 feet of structures to avoid damage to such structures.

220.6 GROUTED RIPRAP:

Place riprap as specified in Section [220.5](#), excluding the use of filter material and secure in place with Portland cement grout meeting the requirements of Table [220-1](#). Place grout to the depth as shown on the plan but in no case less than 70 percent of the depth of riprap. Consolidate grout into place with suitable spades, trowels or other approved means to provide a dense stone and mortar layer with all voids and interstices filled. After grout has been placed, the rocks shall be thoroughly brushed so that their top surfaces are exposed. If required, use water pressure to clean stone faces after the mortar has achieved sufficient strength. The outer rocks shall project 1/3 to 1/4 their diameter above the grouted surface.

TABLE 220-1			
Grout for Riprap			
Minimum Cementitious Material (lbs.)	Maximum W/CM Ratio	Slump (in)	Air Content (%)
850	0.60	9 +/- 2	0 % - 8 %

The cementitious materials shall meet the requirements of Section [725.2](#). Up to 25 percent by weight of the Table [220-1](#) minimum cementitious materials requirements may be an approved coal ash or natural pozzolan. The aggregates shall meet the applicable requirements of ASTM [C33](#), #8 (3/8") coarse aggregate grading and fine aggregate (sand) grading. All Ready Mixed Grout volume calculations shall be based on "absolute volume" with the total volume per cubic yard equal to 27 cubic feet. Coarse aggregate volume shall be a maximum of 35% of the total aggregates volume. All mixing shall be in accordance with the applicable requirements of Section [725.7](#).

The amount of slump shall be the minimum amount needed to permit gravity flow into the interstices with limited spading and brooming. The consistency of the grout shall be as approved by the Engineer.

220.7 MEASUREMENT:

The completed, in place riprap construction within the limits of the dimensions shown on the plans shall be measured. Measurement will be in cubic yards rounded to the nearest cubic yard.

No separate measurement will be made for erosion control geosynthetic fabric, bedding material, or grout.

220.8 PAYMENT:

Payment for riprap will be made for the accepted complete in-place riprap construction at the contract unit price. Riprap construction shall include excavation, ground surface preparation, erosion control geosynthetic fabric (if used for the project), bedding material, riprap stone, grout (if used for the project) and backfilling.

Payment for riprap shall be full compensation for furnishing all material, labor and equipment for riprap construction.

- End of Section -

SECTION 230

DUST PALLIATIVE APPLICATION

230.1 DESCRIPTION:

This Section shall govern the application of dust control palliatives (agents) on unpaved roads, traffic surfaces, vacant lots, construction sites and road shoulders. Dust palliatives may also be used to protect erosion of slopes, embankments, sediment control and re-vegetated areas.

Dust palliatives may be applied as topical treatments to penetrate an undisturbed surface, or may be applied to larger areas using mixing methods that blend the product with surface material and then compact the mixture to provide a stabilized, dust resistant, surface course.

230.2 MATERIALS:

Materials to be used as dust palliatives shall conform to the requirements of Section [792](#). The specific dust palliative to be used shall be as shown on the plans or as directed by the Engineer.

Water used for diluting dust palliatives and for pre-wetting of treated subgrade shall be either potable or from a source compatible with dust palliative ingredients.

230.2.1 Product Verification: The Contractor, in the presence of the Engineer or his designee, shall obtain samples of the bulk, undiluted liquid dust palliative/stabilizer product as it is delivered to the job site. Samples shall be taken from each bulk tanker that delivers the liquid dust palliative/stabilizer for product verification testing purposes. If the bulk undiluted liquid dust palliative/stabilizer is delivered in containers, a sample must be taken from each container delivered to the job site. The Engineer will select the exact locations and times of sampling. The obtained liquid dust palliative/stabilizer samples will be split in three equal portions (minimum 2 ounce each), whereby the Contractor may retain one sealed portion for verification testing, and the Engineer will retain two sealed portions. One portion of the Engineer's samples will be provided to an AASHTO accredited test lab chosen by the Contractor. The other sample will be held for backup until the testing is completed. Sample containers will be labeled and sealed under the supervision of the Engineer.

The accredited lab will test the product in accordance with ASTM [D2834](#) to confirm that the liquid dust palliative/stabilizer meets the requirements of Section [792.2](#) for active solids. Contractor is responsible for the cost of product verification testing.

If the test reports indicate that the minimum acceptable active solids content value as specified in Section [792.2](#) is not met, the quality of the liquid dust palliative/stabilizer product shall be deemed deficient by the Engineer. The delivery and application of a deficient product shall be stopped. Work shall not resume until all product verification testing is complete or the Contractor replaces the product and initial tests on the new material show compliance.

The Contractor may perform additional verification testing on the split samples. In case of dispute where the verification tests produce different results by the Contractor than the Engineer, the Engineer will hire a different independent AASHTO accredited testing laboratory to perform a third round of testing. Such testing and the results of the testing shall be considered final by both the Engineer and Contractor for verification.

230.3 COMPLIANCE:

At least two weeks prior to the start of work, the Contractor shall provide the Engineer the following Applicator qualifications:

- (a) Information showing that the Applicator has at least three years of experience within the last five years serving as either a primary contractor or subcontractor in delivering and applying dust palliative/stabilizer product services,
- (b) A minimum 3 local references (including company/organization name, contact person and telephone number) to demonstrates that the Applicator is familiar with local environmental and permitting requirements associated with soil stabilization and dust palliative, and
- (c) Copy of the Applicator's State of Arizona Registrar of Contractors License.

PART 300

STREETS AND RELATED WORK

Section	Last Revised	Title	Page
301	2014	Subgrade Preparation	301-1
303	2021	Pervious Concrete Base Course	303-1
306	2010	Mechanically Stabilized Subgrade-Geogrid Reinforcement	306-1
309	2017	Lime Stabilization or Modification of Subgrade	309-1
310	2018	Placement and Construction of Aggregate Base Course	310-1
311	2023	Placement and Construction of Cement Treated Subgrade	311-1
312	2023	Cement Treated Base	312-1
315	1998	Bituminous Prime Coat	315-1
317	2013	Asphalt Milling	317-1
320	1999	Road-Mixed Surfacing	320-1
321	2020	Placement and Construction of Asphalt Concrete Pavement	321-1
322	2017	Decorative Asphalt	322-1
323	2021	Placement of Pervious Concrete	323-1
324	2015	Portland Cement Concrete Pavement (PCCP)	324-1
325	2019	Placement and Construction of Asphalt-Rubber Asphalt Concrete	325-1
326	2020	Placement and Construction of Polymer Modified Asphalt Concrete	326-1
327	2012	Hot In-Place Recycling	327-1
329	1998	Tack Coat	329-1
330	1998	Asphalt Chip Seal	330-1
331	2020	Placement and Construction of Asphalt Emulsion Micro-Surfacing Treatments	331-1
332	2020	Placement and Construction of Asphalt Emulsion Slurry Seal Treatments	332-1
333	2012	Fog Seal Coats	333-1
334	2024	Preservative Seal for Asphalt Concrete	334-1
335	2012	Placement and Construction of Hot Asphalt-Rubber Seal	335-1
336	2016	Pavement Matching and Surfacing Replacement	336-1
337	2018	Asphalt Pavement Crack Sealing and Crack Filling	337-1
340	2018	Concrete Curb, Gutter, Sidewalk, Curb Ramps, Driveway and Alley Entrance	340-1
342	2016	Interlocking Concrete Paver Installations	342-1
343	1998	Exposed Aggregate Paving	343-1
345	2021	Adjusting Frames, Covers and Valve Boxes	345-1
350	2013	Removal of Existing Improvements	350-1
355	2015	Utility Potholes-Keyhole Method	355-1
360	2021	Telecommunications Installation	360-1

This Page Reserved for Future Use

SECTION 334

PRESERVATIVE SEAL FOR ASPHALT CONCRETE

334.1 DESCRIPTION:

The asphalt concrete preservative seal shall be composed of an emulsified asphalt or asphalt rejuvenate, or an asphalt sealant to preserve the asphalt concrete pavement.

Preservative seals are applicable for asphalt pavements as directed on the plans, special provisions, or the Engineer.

334.2 MATERIALS:

The preservative seal shall be one of the following materials as specified by the Engineer:

<u>Type</u>	<u>Description</u>	<u>Material Conformance</u>
1	Rejuvenating emulsion	Section 718.1
2	Petroleum hydrocarbon emulsion	Section 718.1
3	Acrylic polymer emulsion	Section 718.1
4	Polymer modified rejuvenating emulsion (PMRE)	Section 718.1
Other	Diluted asphalt emulsion, CSS-1 or SS-1h	Section 713
Asphalt Surface Sealer	“Filled” asphalt surface sealer	Section 718.3
Solar Reflective Pavement	Coatings Solar reflective pavement surface coating	Section 718.4

334.3 CONSTRUCTION METHOD:

The material shall be approved by the Engineer in accordance to this specification. The application rates, dilution and curing shall be directed by the Engineer in accordance with this specification.

The contractor shall be responsible to clean the pavement to be treated free of trash, debris, earth or other deleterious substances present in sufficient quality to not interfere with the work to be performed.

The application rate will be based upon a typical surface condition test site with application rate trials to determine the needed rate. All application rates specified in Section [718](#) shall be a diluted 50-50 emulsified asphalt and water, except as recommended by the manufacturer for Type 2 and Asphalt Surface Sealer. Any over applied seal will be sanded as directed by the Engineer. Application equipment shall be in accordance with Section [330](#).

Before opening a treated area to traffic, the surface shall be checked for slipperiness and/or tackiness. If the treated portion of the roadway must be opened to traffic prior to the disappearance of slipperiness and/or tackiness, the surface shall be sanded with a minimum of 1 ½ pounds per square yard or as directed by the Engineer. Sand Blotter shall comply with Section [333](#).

334.4 MEASUREMENT:

Preservative seal for asphalt concrete will be measured by the gallon or ton applied.

334.5 PAYMENT:

Payment will be made on the basis of the unit price bid in the proposal. Payment shall be full compensation for preservative seal complete and in place.

- End of Section -

SECTION 335

PLACEMENT AND CONSTRUCTION OF HOT ASPHALT-RUBBER SEAL

335.1 DESCRIPTION:

This work shall consist of applying an application of asphalt-rubber binder, a combined mixture of hot paving grade asphalt and crumb rubber modifier. It shall be immediately covered with a cover material.

The work involves furnishing and placing all materials on existing pavement surfaces in accordance with this specification.

335.2 MATERIALS:

The asphalt-rubber binder shall comply with Section [717](#). Sand Blotter shall comply with Section [333](#). Cover material shall be precoated and comply with Section [716](#). Fog seal coats shall comply with Section [333](#).

335.2.1 Certification and Quality Assurance: Prior to application, the Contractor shall submit certification of compliance to the Engineer at least 7 days prior to application for all materials to be used in the work. For example: Asphalt-rubber binder designs (Section [717](#)), cover material test results (Section [716](#)), sand blotter material (Section [333](#)), fog seal coats (Section [333](#)), and any additional materials used on the project.

335.3 EQUIPMENT:

335.3.1 General: The method and equipment for combining the crumb rubber modifier and hot paving grade asphalt shall be so designed and accessible that the Engineer can readily determine the percentage by weight of each of two materials being incorporated into the mixture.

All equipment shall meet requirements of Section [330](#) with the following modifications:

(A) Pneumatic-tired rollers: At least three pneumatic-tired rollers shall be used. Each roller shall carry a minimum of 5,000 pounds on each wheel and a minimum of 90 psi in each tire. Rollers shall not travel in excess of 12 mph.

(B) Distributor: The distributor must be equipped with a mechanical mixing device.

335.3.2 Mechanical Pre-Blender: Crumb rubber modifier and the hot paving grade asphalt for the asphalt-rubber binder may be pre-blended prior to introduction of the blend into the distributor.

The mechanical pre-blender shall be equipped with an asphalt totalizing meter in gallons and a flow rate meter in gallons per minute.

335.4 MIXING:

Mixing shall be done in accordance with Section [717](#). Application shall proceed immediately upon the asphalt-rubber binder requirements being met.

335.5 CONSTRUCTION:

Prior to placing the hot asphalt-rubber binder, soil and other objectionable materials shall be removed from the pavement surface.

The application rate of the hot asphalt-rubber binder shall be 0.55 to 0.70 gallons per square yard or as directed by the Engineer based on field conditions. Material shall be applied at temperatures of 350 degrees F. to 400 degrees F. The application of the cover material shall follow as close as possible behind the distributor truck.

The cover material shall be preheated immediately prior to application and precoated as specified in Section [716](#) - PRECOATED. The temperature of the precoated chips shall be in accordance with Section [330](#).

SECTION 350

(G) Remove median island slabs.

(H) Remove pavements and aggregate base where called for outside the roadway prism.

350.4 PAYMENT:

Payment for removals will be made at the unit proposal price which price shall be full compensation for the item complete, as described herein or on the plans.

- End of Section -

SECTION 355

UTILITY POTHOLES-KEYHOLE METHOD

355.1 DESCRIPTION:

This specification covers the requirements for coring, vacuum excavation, backfilling, and reinstatement of the core into asphalt or concrete pavement.

355.2 EXCAVATION:

Excavation requires coring a circular hole through pavement using drilling/coring equipment and removal of the intact pavement core. The vertical alignment of the coring operation shall be perpendicular to the horizon and cutting shall be extended the full depth of the existing pavement section.

Pavement cores shall not be greater than 24 inches in diameter, shall not be spaced closer than 3 feet between cores (edge to edge), shall not contain a joint or any pavement cracks greater than 1/8-inch wide, and shall only be obtained from pavements where the pavement section is at least 4 inches thick.

Contractor shall place a temporary mark (paint or chalk) on the pavement core and adjacent pavement prior to cutting to insure that the pavement core when replaced will have the same orientation as found in the original pavement.

Pavement cores shall be either removed from the work site or stored in a safe and secure on-site location. The cores shall be made readily available for reinstatement into the pavement.

Soil shall be removed by air/vacuum extraction methods to expose utilities. The zone of soil removal shall remain essentially within a vertical plane extending below the edges of the core hole.

The Contractor shall dispose of all excess materials.

355.3 BACKFILL:

355.3.1 Slurry Backfill: The Contractor shall use ½-sack CLSM as backfill in accordance with Section [728](#).

355.3.2 Leveling Course: A 1-1/2-inch to 2-inch thick leveling course of compacted crushed gravel meeting the requirements of ASTM [C33](#), No. 8 coarse aggregate shall be placed above the backfill and directly below the pavement section.

355.4 PAVEMENT RESTORATION:

The pavement surface shall be restored to its original condition by setting the reinstated pavement core flush with and in its original orientation.

Bonding agent meeting the requirements of Section [708](#) shall be used for pavement core reinstatement. Excess bonding material shall be removed from the restored pavement surface. A “patched” appearance shall be avoided in surface restoration wherever possible.

The contractor shall reinstate the pavement core within 24 hours of cutting the pavement. Holes left open longer than 24 hours after cutting shall be covered with an approved steel road plate capable of supporting traffic loads. The steel plate must be rounded with a fitted collar that, when inserted into the hole, will prevent the steel plate from tipping, tilting, bouncing or spinning out of the hole under traffic conditions. An asphalt mix shall be used to ramp pavement up to the steel plate along all edges.

355.5 SURFACE TOLERANCES:

The reinstated core shall be flush and level with the adjacent pavement. Gaps attributable to the positioning of the core shall be less than 1/16-inch between the bottom of a minimum 3-foot long straightedge and the surface of the pavement in any direction on the surface of the keyhole core, except across the pavement crown or drainage gutters.

SECTION 355

355.6 DEFICIENCIES:

Where the pavement core is found to be fractured or defective upon removal, or becomes damaged after removal and prior to reinstating, the defective or damaged core shall not be used to reinstate the pavement. Pavement repair shall be performed in accordance with Detail 212, Type A Pavement Repair.

A pavement core is considered unacceptable when one of the following conditions exist:

- (a) The core contains any vertical cracks wider than 1/8-inch extending full depth or partial depth through the core; or
- (b) Any deteriorated piece of the core is larger than 10 percent of the overall area of the core.
- (c) Two or more successive layers of asphalt concrete in the core become horizontally delaminated and cannot be rebounded to each other with the bonding compound.

All unacceptable pavement cores shall be removed from the job site.

355.7 MEASUREMENT:

Each acceptable utility pothole repair shall be counted. No distinction shall be made based on size of the utility pothole or method of repair.

355.8 PAYMENT:

Payment at the contract price for utility pothole repair complete in place shall be full compensation for all labor, equipment and material required for a complete in place installation. Payment includes traffic control and disposal of all excess materials.

- End of Section -

SECTION 360

TELECOMMUNICATIONS INSTALLATION

360.1 DESCRIPTION:

This work shall consist of the individual installation of underground telecommunications facilities within the public right-of-way. This specification is not intended for joint trench installations.

Other than as described within this manual or by Agency supplements, all work shall conform to the latest version of the National Electrical Safety Code (NESC).

The contractor shall follow all local and state laws pertaining to locating and protecting existing underground utilities and call AZ811 two working days prior to starting any onsite work. All potholes shall be repaired per Detail 200-1 or Detail 212 as required by the Agency.

360.2 TRENCHING, BACKFILL AND RESTORATION:

All work shall be done in accordance with Section [336](#) and [601](#).

360.3 FACILITY INSTALLATION:

All cables shall be installed within a PVC Schedule 40 or better conduit unless otherwise authorized by the Agency. Conduits shall be placed in the diameter and quantity as specified on the plans.

Facility crossings under existing, paved streets shall be accomplished by trenchless technology in accordance with Section [608](#) unless open trenching is authorized by the Agency.

Minimum conduit depths shall comply with the following requirements unless otherwise approved by the Agency:

- 1) Arterial and collector streets: All new conduits shall be placed at a minimum depth of 48-inches below the finished grade.
- 2) All other streets and alleys: All new conduits shall be placed at a minimum depth of 36-inches below the finished grade.

360.4 CONDUIT IDENTIFICATION AND DETECTION:

All subsurface installations shall be detectable by a locate service by way of a locate wire or other means, such as markers or detection tape, specified by the facility owner and agency, to be installed at the time of installation or by wire integrated into the conduit itself during manufacture.

360.5 PAYMENT:

Payment will be made at the contract unit price bid per lineal foot.

- End of Section -

PART 400

RIGHT-OF-WAY AND TRAFFIC CONTROL

Section	Last Revised	Title	Page
401	2024	Traffic Control	401-1
405	2015	Survey Monuments	405-1
410	1998	Precast Safety Curbs	410-1
415	2022	Flexible Metal Guardrail	415-1
420	1998	Chain Link Fences	420-1
424	1998	Parkway Grading	424-1
425	2023	Topsoils	425-1
430	2023	Landscaping	430-1
440	2023	Landscape Irrigation	440-1

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SECTION 401

TRAFFIC CONTROL

401.1 DESCRIPTION:

Traffic control shall consist of traffic control devices and flagmen or pilot cars. All traffic control devices, the application of traffic control measures, and traffic regulation in these specifications are to supplement and are not intended to delete any of the provisions of the Contracting Agency's Traffic Barricade Manual, the Uniform Manual on Traffic Control Devices or any agency's Supplements to these Uniform Standard Specifications.

401.2 TRAFFIC CONTROL DEVICES:

Traffic control devices shall consist of providing, erecting, and maintaining necessary and adequate devices for the protection of the work, the workmen and the traveling public as approved by the Engineer.

- (A) Temporary traffic control devices shall be used to guide traffic through construction areas. They include traffic cones to channelize traffic, portable barricades for warning, vertical panel channelizing devices to divert traffic, and lighting devices between the hours of sunset and sunrise.
- (B) Advance warning devices shall be used to alert the motorist of an obstruction in the roadway. They include diamond-shaped signs, flags, and flasher type high level warning devices mounted 8 feet above the roadway.

401.3 FLAGMEN OR PILOT CARS:

Flagmen or pilot cars shall consist of providing sufficient flagmen, uniformed off-duty law enforcement officers or pilot cars to expedite the safe passage of traffic.

401.4 TRAFFIC CONTROL MEASURES:

The application of all traffic control measures shall be based primarily upon the conditions existing at the time that such measures are deemed necessary. Prior to the start of any work that would interrupt the normal flow of traffic; sufficient and adequate devices and measures shall be provided and erected as directed by the Engineer. These devices shall be immediately removed when no longer needed.

401.5 GENERAL TRAFFIC REGULATIONS:

A traffic lane shall be a minimum of 10 feet of clear street width with a safe motor vehicle operating speed of at least 25 miles per hour.

An intersection shall be all of the area within the right of way intersection streets plus 300 feet beyond the edge of the intersected right of way on all legs of the intersection.

A minimum of two traffic lanes, one for each direction, shall be maintained open to traffic at all times on all major streets.

- (A) On Bond Issue and Budget Projects: All existing traffic lanes on major streets shall be maintained open to traffic at signalized intersections between the hours of 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. weekdays unless otherwise specified in the special provisions.
- (B) On Improvement District Projects: All existing traffic lanes on major streets shall be maintained open to traffic between the hours of 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. weekdays. All work that enters or crosses a major street must be done at times other than 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. unless otherwise specified in the special provisions.

Local access shall be maintained to all properties on the project at all possible times. When local access cannot be maintained, the Contractor must notify the affected property owner at least 24 hours in advance and restore access as soon as possible.

SECTION 401

A traffic lane shall not be considered as satisfactorily open to traffic unless it is paved with hot mix or cold mix asphalt paving if surrounded by or adjacent to existing pavement. Where pavement did not previously exist or where all of the existing pavement has been removed, a traffic lane shall not be considered as satisfactorily open to traffic unless it is graded reasonably smooth and maintained dust free as directed by the Engineer.

Arrangements for partial or complete street closure permits shall be handled through the Engineer on local projects or the Arizona Department of Transportation, Resident Engineer on Federal Aid Projects, to the Contracting Agency's Traffic Engineering Department. An advance notice of 48 hours for major streets and 24 hours for local streets and alleys is required from the Contractor.

The Contractor shall provide and maintain all necessary traffic controls to protect and guide traffic for all work in the construction area.

The Contractor shall maintain all existing STOP, YIELD, and street name signs erect, clean, and in full view of the intended traffic at all times. If these signs interfere with construction, the Contractor shall temporarily relocate the signs away from construction but still in full view of the intended traffic.

The Traffic Engineering Department will reset all STOP, YIELD, and street name signs to permanent locations.

Existing traffic signs other than STOP, YIELD, and street name signs shall be maintained by the Contractor until such time as construction renders them obsolete. At that time, the Contractor shall remove signs and posts without damage and deliver them as directed by the Engineer. The Traffic Engineering Department will reinstall all traffic signs.

Subject to the approval of the Traffic Engineer, the Contractor shall furnish and install the 25 MPH Construction Zone Speed Limit Signs. The Contractor shall maintain the signs erect, clean and in full view of the intended traffic at all times. Should the signs interfere with construction, the Contractor shall relocate the signs as necessary.

At any time project construction shall require the closure or disruption of traffic in any roadway, alley, or refuse collection easement such that normal refuse collection will be interfered with, the Contractor shall prior to causing such closure or disruption, make arrangements with the Contracting Agency's Sanitation Department in order that refuse collection service can be maintained.

Special traffic regulation will be listed in the special provisions.

401.6 MEASUREMENT:

No measurement will be made for traffic control devices.

Flagmen, uniformed off-duty law enforcement officers or pilot cars, with driver, will be measured by the hour for each individual, including vehicle and equipment, required to perform traffic control. When an officer is used less than 3 hours, a minimum of 3 hours will be charged. Anything over 3 hours will be measured by the hour.

401.7 PAYMENT:

Payment will be made at the contract bid price in the proposal for uniformed, off-duty law enforcement officer. If the officer is utilized in excess of 8 hours in any calendar day or in excess of 40 hours in any calendar work week, payment shall be at the rate of 1 1/2 times the contract bid price for all hours worked in excess in either of the above time periods.

- End of Section -

PART 600

WATER, SEWER, STORM DRAIN AND IRRIGATION

Section	Last Revised	Title	Page
601	2022	Trench Excavation, Backfilling and Compaction	601-1
602	2019	Trenchless or Open Cut Installation of Steel Casing	602-1
604	2018	Placement of Controlled Low Strength Material	604-1
605	2024	Subdrainage	605-1
607	2015	Trenchless Installation of Smooth Wall Jacking Pipe	607-1
608	2017	Horizontal Directional Drilling	608-1
610	2024	Water Line Construction	610-1
611	2022	Water, Sewer and Storm Drain Testing	611-1
615	2023	Sanitary Sewer Line Construction	615-1
616	2017	Reclaimed Water Line Construction	616-1
618	2023	Storm Drain Construction	618-1
620	2012	Cast-In-Place Concrete Pipe	620-1
621	1998	Corrugated Metal Pipe and Arches	621-1
625	2020	Manhole Construction and Drop Sewer Connections	625-1
626	2021	Corrosion Coating of Sanitary Sewer Manholes	626-1
627	2020	Painting Sanitary Sewer Manholes with Insecticide	627-1
630	2019	Tapping Sleeves, Valves and Valve Boxes on Water Lines	630-1
631	2020	Water Taps and Meter Service Connections	631-1

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SECTION 604

noncorrosive material around the pipe e.g., native material, import material, etc. or provide a protective covering or wrapping such as polyethylene wrap per Section [610.6](#). Pipes smaller than 4 inches can be completely wrapped with tape as per Section [610.6](#) or approved equal.

Generally, CLSM does not resist freezing and thawing and in some cases may propagate the condition. CLSM mixes must be modified where long term freeze-thaw durability is indicated as a concern. The mix design shall have an air content of no less than six percent by volume, when tested in accordance with ASTM [D6023](#).

604.4 PERFORMANCE TESTING:

CLSM placed within the traveled way or otherwise to be covered by paving or embankment materials, shall not be covered until one of the following performance criteria have been met:

- (A) When a person of average weight and shoe size can walk on the surface of the CLSM without creating greater than 1/8-inch indents in the material, or
- (B) When the in-place CLSM has reached a strength of 30 psi, when tested in accordance with ASTM [D4832](#), or
- (C) When a ball drop indentation of 3-inches or less is obtained, when tested in accordance with ASTM [D6024](#), or
- (D) When a penetration resistance reading of 650 is achieved, when tested in accordance with ASTM [C403](#).

Additionally, CLSM shall not be covered if proof rolling by pneumatic-tired or steel wheel vibratory roller results in the bringing of free water to the surface or results in surface undulation (pumping).

When CLSM is placed in foundation excavations, the material shall be protected from foundation loading and placement of foundation concrete prior to having reached initial set per ASTM [C403](#), or allowed to set in place for 24 hours, whichever occurs first.

604.5 ACCEPTANCE:

CLSM shall be considered deficient and may be rejected at the discretion of the Engineer if:

- (A) The CLSM is outside of the limits specified in Table [728-1](#) and/or
- (B) The aggregate gradation is outside the limits specified in Section [728.2](#).

Rejected material not placed shall be immediately removed from the job site. Rejected material placed shall be removed and replaced with acceptable material. Removing and disposing of the rejected material shall be at no additional cost to the Contracting Agency.

604.6 PAYMENT:

No pay item will be included in the proposal nor direct payment made for CLSM unless specifically included in the Project Specifications and Fee Proposal. The cost for placing the material shall be included in the unit price for the specific work function (laying pipe, placing structure foundation, construction retaining wall, etc.).

- End of Section -

SECTION 605

SUBDRAINAGE

605.1 DESCRIPTION:

The subdrainage system shall be constructed in accordance with the notes and details shown on the plans and the applicable provisions of these specifications except as modified in the special provisions.

605.2 CONCRETE:

All concrete placed in drainage structures, subdrain outlets, pipe collars, and similar features of the subdrainage system shall conform to the applicable provisions of Section [725](#).

605.3 SUBDRAINAGE PIPE:

Subdrainage pipe, both perforated and non-perforated, shall be either bell and spigot concrete, bell and spigot vitrified clay, or corrugated metal pipe, as shown on the plans or specified in the special provisions. However, if the particular kind of pipe is not shown on the plans nor specified in the special provisions, subdrainage pipe shall be concrete pipe of at least standard strength quality and shall conform to the requirements of Section [736](#). Vitrified clay pipe shall conform to the requirements of Section [743](#). Corrugated metal pipe shall conform to the requirements of Section [760](#).

605.3.1 Pipe Joints: Unless the pipe joints are of a self-aligning type, have the bottom half of the bell joint filled with mortar to securely hold the pipe in alignment and to bring the inner surface of abutting pipes flush and even. Where a tight joint for non-perforated pipe is required, the bell joint shall be completely filled with mortar.

605.4 SUBDRAINAGE MANHOLES:

Subdrainage manholes, including inlets, outlets, flap gates, and gate boxes, shall comply with the requirements of the plans and the special provisions.

605.5 FILTER MATERIALS:

The filter materials shall be placed within the limits shown on the plans. The compositions of the filter materials shall each conform to one of the grading requirements in Table [605-1](#); the particular requirement to be used will be specified in the special provision.

The materials used shall conform to requirements for concrete aggregates in Section [725.3](#); however, the requirements for grading, and reactivity, as stated therein, shall not apply. The minimum bulk specific gravity shall be 2.50, by ASTM [C127](#).

TABLE 605-1			
FILTER MATERIAL GRADING - % PASSING			
Screen or Sieve Size	TYPE		
	F1	F2	F3
3/4"	—	100	100
3/8"	100	80 – 100	70 – 100
No. 4	90 – 100	60 – 85	45 – 75
No. 8	75 – 90	45 – 70	30 – 60
No. 16	55 – 80	30 – 55	20 – 45
No. 30	30 – 60	15 – 40	10 – 30
No. 50	10 – 40	5 – 20	0 – 15
No. 100	0 – 15	0 – 10	0 – 5
No. 200	0 – 5	0 – 5	—

SECTION 610

610.6.4 Payment for Polywrap: Payment for this item shall be per the provisions of Subsections [109.4](#) and [109.5](#) of the specifications unless this item is specifically called for on the plans or in the supplemental specifications or special provisions as a specific component and pay item for a given project.

610.7 VALVES:

Valves shall be installed in accordance with AWWA C600 or AWWA C603 modified as follows:

All tapping sleeves, gate valves, butterfly valves, air release and vacuum valves and corporation stops shall be in accordance with Section [630](#).

Just before installation in the trench, valves shall be fully opened and closed to check the action, and a record made of the number of turns required to fully open or close the valve. For valves 16 inches and larger, a member of the water utility shall be present to check the action and record the number of turns. The inside of all valves shall then be thoroughly cleaned and the valve installed.

Valves 12 inches and smaller in size shall be supported by concrete blocks, in accordance with the standard details.

Valves 16 inches and larger in size along with their bypass valves, shall be supported on concrete slabs, and/or concrete piers, as indicated on the plans.

Concrete supports shall be provided under valves in vaults and manholes, and shall be constructed an inch low, then grouted with non-shrink grout. Adjustable pipe supports shall be as indicated on the plans. Buried valves shall be supported on concrete blocks as detailed on the plans.

Valve boxes shall be installed over all buried valves in accordance with standard details.

Standard couplings or matching joints shall be used when more than one length of pipe is required, or when two or more pieces are joined, to form the valve box riser. Install extension stems on all valves where the operating nut is 5 feet or more below grade.

610.8 MANHOLES AND VAULTS:

Construction shall consist of furnishing all materials and constructing manholes or vaults complete in place, as detailed, including foundation walls, frames, covers, and any incidentals thereto, at location shown on the plans.

Manholes shall be constructed to conform to the requirements of Section [625](#) and standard details, except the inside diameter shall be 60 inches.

Vaults shall be constructed of reinforced concrete conforming to Section [725](#) and of concrete pipe, conforming to ASTM [C76](#) Wall A or B. Vaults shall be kept moist for 7 days before backfilling.

610.9 FIRE HYDRANTS:

The Contractor shall furnish all labor, materials, and equipment necessary to install fire hydrants complete in place at locations shown on the plans in accordance with the standard details and special provisions. Fire hydrants furnished by the Contractor shall conform to the requirements of Section [756](#).

If paint is chipped, scuffed, or otherwise damaged during handling and installation, the Contractor shall touch up such spots as may be designated by the Engineer.

All hydrants must be flushed and left in good working condition with the control valve open.

SECTION 610

610.10 COUPLINGS, JOINTS, GASKETS AND FLANGES:

- (A) **Couplings:** The couplings used to join the pipe to flanged valve adapters shall have a minimum working pressure of 150 psi, and shall have a fusion-bonded epoxy finish. The coupling sleeves shall be carbon steel with a minimum yield of 30,000 psi. The flanges shall have a minimum yield of 30,000 psi and be ductile iron or carbon steel for sizes up to 12", or high-strength, low-alloy steel for sizes 14" and larger.
- (B) **Joints:** The joints and fitting shall conform to Sections [750](#) and [752](#).

Bolts and Nuts:

- (1) Bolts, studs, and nuts used in underground field flanged connections or for connecting fittings shall be carbon steel compliant with ASTM [A307](#), Grade A unless Grade B is specified. Bolts, studs, and nuts shall be in accordance with AWWA C111. Bolts and studs shall have Class 2A thread tolerance with the corresponding nuts having Class 2B tolerance. Bolts, studs and nuts shall have a hot-dipped zinc coating in accordance with ASTM [F2329](#). All bolt diameters shall normally be 1/8 inch smaller than the bolt hole diameter. If specified, allowable exceptions to zinc coating shall be bolts, studs, and nuts made from 316 stainless steel per ASTM [F593](#) or cadmium plated per ASTM [B766](#). All bolts shall be hexagonal heads.
- (2) The minimum requirement for underground mechanical joint connections using T-head bolts shall meet the requirements of AWWA C111 using a high strength low alloy steel manufactured for atmospheric corrosion resistance per ASTM [A242](#).

These bolted joints shall be protected as follows: Following installation and before backfilling, all couplings, steel flanges, bolts, nuts, anchor bolts and rods, bolting of all flanged valves, and all exposed steel shall be protected from corrosion by either of the two methods outlined below at the Contractor's option.

- (A) Below ground installations shall be coated with NO-OX-ID "A" with a film of not less than 1/32 inch thick and then coated with cement mortar not less than 1 inch thickness before backfilling. Cement mortar shall be composed of 1 part cement, ASTM [C150](#), Type II, low alkali, to 3 parts sand. Before application of the cement mortar coating the area to be protected shall be covered with a layer of 2 x 2 inch No. 14 gage welded wire fabric, firmly wired in place.
- (B) Below ground installations shall be protected by the application of hot coal-tar enamel. The coal-tar enamel shall be in accordance with AWWA C203 and shall be applied to the top part of the pipe or fittings by daubers for at least two coats for a total minimum thickness of 1/16 inch. The coal tar for under side of the pipe flanges or fittings shall be applied by the pan or cocoon method as described below and in AWWA Manual M-11, Steel Pipe.

Pan Method: The coating pan is securely anchored in place on the underside of the pipe and straddling the connection to be coated. The pan shall be wide enough so that the entire connection will be coated.

Hot coal-tar enamel is poured into the pan, from one side only, until the pan is completely filled. The drain plug or valve, is then opened and the excess coal tar drained out. The pan can then be removed. Details of the coating pan and corresponding dimensions are given in AWWA Manual M-11.

The upper portion of the connection, and all remaining exposed steel pipe, will then be coated by the use of a dauber. The coal tar coating shall be applied in at least two coats for a minimum thickness of 1/16 inch. The daubers and method of application shall conform to AWWA C203. No thinning will be allowed.

- (C) **Cocoon Method:** The cocoon is formed by placing glass fiber cloth or roofing paper, of the proper width, around the underside of the connection and adjacent exposed steel pipe. The edges of the cocoon shall be securely fastened to the pipe. Backfill is lightly placed to the spring line, and the top of the cocoon is opened and layed back on the filled area and hot coal-tar enamel poured, from one side only, until the cocoon is completely filled. The loose backfill prevents rupture of the cocoon. The upper portion of the connection and remaining exposed steel pipe shall be coated as above.

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- (D) **Gaskets:** Except as otherwise provided, all gaskets for pipelines shall be one-piece full faced gaskets from one-ply cloth inserted SBR rubber material. Gaskets for all pipe diameters shall be 1/8 inch-thick material. Gasket material shall meet ANSI C111 and AWWA A21.11. Physical characteristics of the rubber compounds shall meet NSF/ANSI 61 drinking water standards.
- (E) **Flanges:** Cast iron flanges shall conform to AWWA C110 as to material, diameter, thickness, drilling, etc. Steel flanges shall be ring or hub type, and shall conform to AWWA C207, Class D. All flanges shall be drilled and have flange diameters and bolt circles conforming to AWWA C110, except bolt holes will be 1/8 inch larger than the bolts given for the various sizes. All bolts shall be as specified above and all flanges shall have a flat facing.

610.11 CONNECTION TO EXISTING MAINS:

Existing pipe to which connections are to be made shall be exposed by the Contractor as directed by the Engineer, to permit field changes in line, grade or fittings, if necessary. All connections to existing mains shall be constructed according to the plans.

Valves connecting new work to the existing system shall be kept closed at all times.

Only Agency personnel shall operate existing valves. The Contractor shall not operate valves in the existing system.

After disinfected samples have been taken and the new work passes the bacteriological tests, the new line shall then be turned over to the Contracting Agency with all branch lines and tie-in valves closed.

When shutdown of an existing water main is necessary in order to connect to the new lines, the Contractor shall make application and pay the required charges to the Contracting Agency. A conference between the Contractor's representative, Engineering Inspection, and Water Distribution personnel shall establish the time and procedures to insure that the shutdown will be for the shortest possible time. If necessary to minimize inconvenience to customers, shutdowns may be scheduled during other than normal working hours. The water supply to some customers, such as hospitals, cannot be shut off at any time. Provisions to furnish a continuous supply of water to such establishments will be required. After the procedures and time for a shutdown are agreed upon, it shall be the Contractor's responsibility to notify all customers in advance that the water will be turned off. When possible, customers shall be notified 24 hours in advance and in no case, except in emergency, shall notification be less than 30 minutes. Notification shall be in writing, giving the reason for the shutdown and the time and duration the water service will be shut off.

The Contracting Agency will close existing valves, but will not guarantee a 100% complete shutdown.

610.12 FIRE LINE SERVICE CONNECTIONS:

Fire line service connections shall be installed in accordance with standard details.

The fire line from the control valves at the main to the detector check valve shall be constructed of ductile iron pipe per Section [750](#).

610.13 METER SERVICE CONNECTIONS:

All new meters must be installed by the Contracting Agency after the proper application as required by Code with fees paid at prevailing rates.

When plans call for connections from a new water main to an existing water meter, the work shall include new copper pipe and fittings, except as follows:

- (A) Wrapped galvanized pipe shall be used to connect or extend existing galvanized service pipe. Type K soft copper pipe or tubing shall be used to connect or extend existing copper service pipe except when otherwise called for in the plans.

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- (B) When the existing main is not abandoned, and the existing meter is to be connected to the new line, the corporation stop at the old main shall be closed and the abandoned service line cut 6 inches from the old main.
- (C) Taps and service connections to the new main shall be made prior to testing and disinfection of the new line.
- (D) Meter service piping may be installed by drilling in place of open cut construction when approved by the Engineer.

When called for on the plans, the meter and box shall be relocated by the Contractor as directed by the Engineer. Existing meters, which are shown on the plans to be relocated, shall be located and installed in accordance with standard details.

Water meter boxes, which are broken during construction, shall be replaced by the Contractor at no additional cost to the Contracting Agency. Existing meter boxes, which are already broken prior to start of construction, shall be replaced by the Contractor with boxes furnished by the Contracting Agency. Boxes may be picked up by the Contractor after written authorization is received from the Engineer. The written authorization shall include the street address of each broken meter box and the size of meter box required. All water meter boxes shall conform to the standard details.

610.14 CLEANUP:

When testing, chlorination, compaction, and cleanup do not follow pipe laying in an orderly manner, the Engineer reserves the right to close down trenching and pipe laying until these operations are adequately advanced.

610.15 PAVEMENT AND SURFACING REPLACEMENT:

Pavement and surfacing replacement shall be in accordance with the requirements of Section [336](#).

610.16 MEASUREMENT AND PAYMENT:

(A) Pipe:

- (1) Measurement of all pipe shall be of the linear feet of pipe installed, measured along the centerline of the pipe, through all valves and fittings, from the centerline of the fittings or centerline of valves on ends of pipe to the centerline of fittings, centerline of valves on ends of pipe or to the end of pipe, as the case may be, for all through runs of pipe. Measurement of lateral line pipes shall start at the centerline of valve at connection to the main. Measurement of service lines shall be from the centerline of the new main to the connection at the meter. Measurement shall be to the nearest foot.
- (2) Payment will be made at the contract unit price per linear foot of each type and size of pipe. Such payment shall be compensation in full for furnishing and installing the pipe and fittings, specials, adapters, etc., complete in place, as called for on the plans and/or on the standard details, and shall include all costs of excavation, removal of obstructions, shoring and bracing, bedding, backfilling, compaction, maintenance of traffic, testing, disinfecting, connections to existing lines or works, and all work not specifically covered in other pay items.

(B) Service Line Connections: Measurement shall be of the number of unit connections made for water services, if called for in the bid. Each bid item unit shall consist of the connection to the water main and to the meter, as may be required in the plan details. Payment will be made at the contract unit price for each water service connection and shall be compensation in full for labor materials (other than pipe) equipment, tapping, and all necessary incidentals. Payment for new service pipe required to make the connection will be made separately, as stipulated above. If no contract bid item exists for connections, then the cost for connections to meters and main lines shall be included in the corresponding pipe bid item unit price.

(C) Relocation of Existing Meters and Boxes: Measurement shall be of the number of meters and boxes moved and reinstalled. Payment will be made at the contract unit price for each meter and box relocated and installed.

(D) Permanent Pipe Supports and Encasement of Existing Pipes: Measurement shall be of each unit included in the bid, and payment shall be compensation in full for supporting or encasing existing pipe, as required on the plans, including excavation, form work, reinforcing, concrete, handling and controlling flows in the existing pipe, removing and replacing

PART 700
MATERIALS

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739	2015	<u>Steel Reinforced Polyethylene Pipe & Fittings for Storm Drain, Irrigation & Sanitary Sewer</u>	739-1
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SECTION 710

The mix design shall be submitted to the Agency or Engineer by the Contractor/Supplier for which it was developed as part of his project submittals. Once the mix design has been approved by the agency or Engineer, the Contractor and/or his supplier shall not change plants nor use additional mixing plants without prior approval of the Engineer. If a Contractor/Supplier elects to change the source of mineral admixture or binder, a volumetric check point may be completed in lieu of a new mix design. The checkpoint shall comply with the mix design volumetric parameters listed in Table [710-3](#) for Marshall mixes or Table [710-5](#) for Gyratory mixes. Any change shall be to an equal alternative material, and this shall not apply to changes in aggregate source. Any changes in the plant operation, the producer's pit, modifiers in the asphalt binder, or any other item that will cause an adjustment in the mix, shall be justification for a new mix design to be submitted.

710.3.2 Mix Design Criteria: The mix design shall be performed by one of two methods, Marshall Mix Design or Gyratory Mix Design. The method shall be specified on the plans, special provisions, or by the Engineer. A minimum of 4 points will be used to establish the mix design results. The oven aging period for both Marshall and Gyratory mix design samples shall be 2 hours.

710.3.2.1 Marshall Mix Design: The Marshall Mix Design shall be performed in accordance with the requirements of the latest edition of the Asphalt Institute's Manual, MS-2 "Mix Design Methods for Asphalt Concrete." The mix shall use the compactive effort of 75 blows per side of specimen. The mix shall comply with the criteria in Table [710-3](#).

TABLE 710-3				
MARSHALL MIX DESIGN CRITERIA				
Criteria	Requirements			
	3/8" Mix	1/2" Mix	3/4" Mix	Designated Test
1. Voids in Mineral Aggregate: %, min	15.0	14.0	13.0	AI MS-2
2. Effective Voids: %, Range	4.0±0.2	4.0 ±0.2	4.0 ±0.2	AI MS-2
3. Absorbed asphalt: %, Range*	0-1.0	0-1.0	0-1.0	AI MS-2
4. Dust to Eff. Asphalt Ratio, Range **	0.6-1.4	0.6-1.4	0.6-1.4	AI MS-2
5. Tensile Strength Ratio: % Min.	65	65	65	ASTM D4867
6. Dry Tensile Strength: psi, Min.	100	100	100	ASTM D4867
7. Stability: pounds, Minimum	2,000	2,500	2,500	AASHTO T-245
8. Flow: 0.01-inch, Range	8-16	8-16	8-16	AASHTO T-245
9. Mineral Aggregate Grading Limits				AASHTO T-27
		Percent Passing with Admix		
Sieve Size	3/8 inch Mix	1/2 inch Mix	3/4 inch Mix	
1-1/4 inch	—	—	—	
1 inch	—	—	100	
3/4 inch	—	100	90 – 100	
1/2 inch	100	85 – 100	—	
3/8 inch	90-100	62 – 85	62 – 77	
No. 8	45-60	40 – 50	35 – 47	
No. 40	10-22	10 – 20	10 – 20	
No. 200	2.0 – 10.0	2.0 – 10.0	2.0 – 8.0	

* Unless otherwise approved by the Engineer.

** The ratio of the mix design composite gradation target for the No. 200 sieve, including admixture, to the effective asphalt content shall be within the indicated range.

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710.3.2.2 Gyratory Mix Design: Gyratory Mix Designs shall be performed in accordance with the requirements of latest edition of the Asphalt Institute's SP-2 manual. Mix design laboratory compacted specimens shall be prepared using a gyratory compactor in accordance with AASHTO T-312.

The mix design shall be formulated in a manner described for volumetric mix designs in the current edition of the Asphalt Institute Manual SP-2, except the number of trial blend gradations necessary will be determined by the mix design laboratory. Duplicate gyratory samples shall be prepared at a minimum of four (4) binder contents to select the recommended binder content. The gyratory specimens shall be compacted to 160 gyrations. Volumetric data for the design number of gyrations, N_{des} , and the initial number of gyrations, N_{ini} , are then back calculated based on the bulk specific gravity, G_{mb} , of the N_{max} specimens and the height data generated during the compaction process of those same specimens.

TABLE 710-4	
Number of Gyrations	
N_{ini}	8
N_{des}	100
N_{max}	160

The corrected density of the specimens shall be less than 89.0 percent of maximum theoretical density at N_{ini} . The corrected density of the specimens shall be less than 98.0 percent of maximum theoretical density at N_{max} . The Gyratory mix shall comply with the criteria in Table [710-5](#).

TABLE 710-5				
GYRATORY MIX DESIGN CRITERIA				
Criteria	Requirements			Designated Test
	3/8" Mix	1/2" Mix	3/4" Mix	Method
1.Voids in Mineral Aggregate: %, Min.	15.0	14.0	13.0	AI SP-2
2.Effective Voids: %, Range	4.0 ± 0.2	4.0 ± 0.2	4.0 ± 0.2	AI SP-2
3.Absorbed Asphalt: %, Range *	0 - 1.0	0 - 1.0	0 - 1.0	AI SP-2
4.Dust to Eff. Asphalt Ratio, Range **	0.6 – 1.4	0.6 – 1.4	0.6 – 1.4	AI SP-2
5.Tensile Strength Ratio: %, Min.	75	75	75	ASTM D4867
6.Dry Tensile Strength: psi, Min.	75	75	75	ASTM D4867
7. Mineral Aggregate Grading Limits				AASHTO T-27
	Percent Passing with Admix			
Sieve Size	3/8 inch Mix	1/2 inch Mix	3/4 inch Mix	
1 inch	—	—	100	
3/4 inch	—	100	90-100	
1/2 inch	100	90-100	43-89	
3/8 inch	90-100	53-89	—	
No. 8	32-47	29-40	24-36	
No. 40	2-24	3-20	3-18	
No. 200	2.0-8.0	2.0-7.5	2.0-6.5	

* Unless otherwise approved by the Engineer.

** The ratio of the mix design composite gradation target for the No. 200 sieve, including admixture, to the effective asphalt content shall be within the indicated range.

SECTION 713

713.4 TEMPERATURES:

Unless otherwise specified, the various grades of emulsified asphalt shall be applied at temperatures within the limits specified in Table [713-3](#) the exact temperature to be determined by the Engineer. Emulsified asphalt shall be reheated if necessary. However, at no time, after loading into a tank car or truck for transportation to the work site, shall the temperature of the emulsion be raised above the maximum temperature shown in Table [713-3](#). During all reheating operations, the emulsified asphalt shall be agitated to prevent localized overheating. Emulsified asphalt shall not be permitted to cool to a temperature of less than 40 degrees F.

TABLE 713-3		
APPLICATION TEMPERATURE OF EMULSIFIED ASPHALT		
Grade of Emulsified Asphalt	Minimum °F	Maximum °F
RS-1, MS-1, SS-1, SS-1h, CSS-1, CSS-1h	70° F	140° F
RS-2, MS-2, MS-2h, CRS-1, PMCQS-1h, LMCQS-1h, CRS-1h, CRS-2h, CMS-2, CMS-2h, QSH, CQSH	125° F	185° F

Emulsified asphalt shall be heated in such a manner that steam or hot oils will not be introduced directly into the emulsified asphalt during heating.

713.5 CONVERSION OF QUANTITIES:

When pay quantities of emulsified asphalt are determined from volumetric measurements, the volumetric measurement at any temperature shall be reduced to the volume the material would occupy at 60 degrees F in accordance with ASTM [D1250](#). In converting volume to weight, the computations shall be based on Table [713-4](#).

TABLE 713-4		
EMULSIFIED ASPHALTS QUANTITY CONVERSION		
Grade of Material	Gals Per Ton at 60° F	Lbs. Per Gal. at 60° F
All grades	238	8.40

- End of Section -

SECTION 714

MICRO-SURFACING MATERIALS

714.1 GENERAL:

Micro-surfacing materials shall consist of a properly proportioned mixture of cationic polymer solids or latex modified asphalt emulsion, mineral aggregates, mineral filler, water, and other additives. Micro-surfacing is designed to provide skid resistant texture, improve surface friction and extend the service life of the existing pavement. Micro-surfacing allows for higher than normal application rates and/or multiple layer applications for rut filling and roadway leveling.

All material sources must be approved prior to their use. The Contractor shall submit a job mix formula, and if requested, pre-qualifications for materials at least seven (7) days prior to start of construction. When requested, additional samples shall be furnished during the construction period at no cost to the Agency. This is a non-pay item.

714.2 AGGREGATE:

714.2.1 Mineral Filler: Mineral filler shall consist of finely divided matter, such as hydrated lime, Portland cement, limestone dust or coal ash, conforming to the requirements of ASTM [D242](#). Mineral filler shall be used only when needed to reduce the setting time, to improve the workability, or to reduce the stripping characteristics of the aggregate emulsion mixture. The minimum amount of the required filler shall be used, and shall be considered as part of the blended aggregate.

A certificate shall be submitted with the job mix formula demonstrating conformance to the requirements of ASTM [D242](#).

714.2.2 Mineral Aggregate: Coarse and fine aggregates shall be per Section [701](#). Aggregates shall be 100% crushed with no rounded particles. No natural sand shall be allowed. The use of recycled asphalt (RAP) may be used with prior approval of the Engineer. The mineral aggregate shall conform to the requirements of Table [714-1](#). Historical test data from source aggregate may be used, if tested within the past year.

Type I. This aggregate gradation is used to seal and fill minor surface voids.

Type II. This aggregate gradation is used to fill surface voids, address surface distresses, seal, and provide a durable wearing surface.

Type III. This aggregate gradation provides maximum skid resistance and an improved wearing surface. This type of surface is appropriate for heavily traveled pavements, rut filling, or for placement on highly textured surfaces requiring larger size aggregate to fill voids.

If more than one kind of aggregate is used, the correct amount of each kind of aggregate needed to produce the required gradation shall be proportioned separately in a manner that shall result in a uniform and homogeneous blend. The final blended aggregate shall meet the requirements of Table [714-1](#).

SECTION 714

TABLE 714-1			
MICRO-SURFACING AGGREGATE			
GRADATION TEST METHOD ASTM C136 / C117			
SIEVE SIZE	TYPE I % PASSING	TYPE II % PASSING	TYPE III % PASSING
3/8	100	100	100
No. 4	100	85-100	70-90
No. 8	90-100	65-90	45-70
No. 16	65-90	45-70	28-50
No. 30	40-60	30-50	19-34
No. 50	25-42	18-30	12-25
No. 100	15-30	10-21	7-18
No. 200	10-20	5-15	5-15
ASTM TEST METHOD	TEST		REQUIREMENTS
D2419	Sand Equivalent		50, minimum
D5821	Fractured Faces		100%
D4318	Plasticity Index		NP
C131	L.A. Abrasion		35 percent, maximum
Arizona 238	Percent Carbonates		20 percent, maximum

The gradation of the aggregate stockpile shall not vary by more than the gradation band specification listed in Table 714-1.

714.3 WATER:

Water shall be potable water, free of any injurious impurities. The Contractor shall identify the water source to the Engineer.

714.4 ADDITIVES:

Additives may be used to accelerate or retard the breaking point and set times of the mix, or to improve the resulting finished surface.

The use of additives in the mix shall be supplied in quantities predetermined by the laboratory job mix formula.

714.5 BITUMINOUS MATERIAL:

The asphalt emulsion used for micro-surfacing shall meet the requirements specified in Section [713](#).

Each tank of emulsion produced shall be certified as to its compliance with these specifications; this certification shall include a certificate of analysis indicating the percent asphalt residue of each tank supplying emulsion to the project. This certificate of analysis shall accompany the placement machine and shall be provided to the Engineer upon request.

When required, the quick setting emulsified asphalt shall be of the cationic quick set type such as PMCQS-1h or LMCQS-1h that shall react to chemically active mineral fillers such as Portland cement in such a way that the applied micro-surfacing mixture can support controlled traffic in 45-60 minutes after application. The amount of chemically active filler shall be determined by job mix formula and field performance.

SECTION 714

714.6 MODIFIER TYPE AND CONTENT:

Modified cationic quick setting emulsion (PMCQS-1h or LMCQS-1h) shall be homogeneous and the modifier used shall consist of either a polymer solid milled into the asphalt or latex blended prior to the emulsification process. The PMCQS-1h and LMCQS-1h shall contain a minimum of 4% polymer solids or latex and shall conform to Section [713](#).

A certification of the polymer solids or latex content and type by the supplier shall be required throughout the duration of the contract. Each tank of emulsion produced shall be certified as to its compliance with these specifications; this certification shall include a certificate of analysis indicating the percent asphalt residue of each tank supplying emulsion to the project. This certificate of analysis shall accompany the placement machine and shall be provided to the Engineer upon request.

Placement of micro-surfacing is temperature dependent and should be tested under field conditions.

714.7 JOB MIX FORMULA:

714.7.1 General: The job mix formula shall be designed to provide a suitable surface for traffic conditions, climate and curing. All materials shall be pre-tested in the laboratory to determine their suitability for use in the micro-surfacing. The job mix formula shall be evaluated using a minimum of three emulsion contents to determine which emulsion content shall yield the optimum emulsion content that meets the requirement of [714-2](#).

The report must clearly show the theoretical recommended proportion of aggregate, mineral filler (Minimum & Maximum), water (Minimum & Maximum), additive(s), and asphalt based on the dry weight of aggregate.

The Contractor shall provide a job mix formula from an AASHTO re:source accredited laboratory and present certified test results for the Engineer's approval. Compatibility of the aggregate and polymer solids or latex modified emulsion shall be certified by the emulsion manufacturer. All the materials used in the job mix formula shall be representative of the materials proposed by the Contractor for use in the project. The job mix formula shall not be older than one (1) calendar year. A new job mix formula shall be required if any material changes are made to the original design.

All the products used in the construction shall have certifications from the suppliers, and these certifications shall be given to the Engineer upon delivery to the project.

Job mix formula and proportioning shall be approved by the Engineer prior to the start of the project.

714.7.2 Specifications:

The specification limits are shown in Table [714-2](#).

SECTION 714

TABLE 714-2			
MICRO-SURFACING JOB MIX FORMULA			
ASTM TEST METHOD	ISSA TECHNICAL BULLETIN	TEST	REQUIREMENTS
		Residual Asphalt, % by dry weight of aggregate	6.0 – 11.5
D242		Mineral Filler, % by dry weight of aggregate.	0.1 – 2.0
		Modifier Content, % (see Section 714.6)	4, minimum.
		Additive	As required for mix properties
		Water	As required for mix properties
C136/ C117		Aggregate Grading	Meets requirements of Table 714-1
	TB-106	Consistency, cm.	2.5-3.0
	TB-100	Abrasion Loss (Wet Track Abrasion Test) One Hour Soak, g/ft ² Six Day Soak, g/ft ²	50, maximum 75, maximum
	TB-114	Wet Stripping, %	90, minimum
	TB-139	Wet Cohesion Test, at 77° F Set Time Test: (30 minutes), kg-cm Early Rolling Traffic Time: (60 minutes), kg-cm	12, minimum 20, minimum
	TB-102	Quick Set Emulsion Mix Properties Micro-Surfacing Setting Test, 70-85 ° F. (1-hour cure) Micro-Surfacing Water Resistance Test, 70-85 ° F. (30-minute cure)	No Brown Stain No More Than Slight Discoloration
	TB-115	Split Consistency Test	Uniform
	TB-113	Mix Time Micro-Surfacing Mixing, 70-85 ° F., Sec.	120, minimum
	TB-147	Measurement of Stability and Resistance to Compaction, Vertical and Lateral Displacement of Multi-layered Fine Aggregate Cold Mixes	Lateral Displacement 5%, maximum Specific Gravity 2.10, maximum
	TB-109	Loaded Wheel Sand Adhesion	50 g/ft ² , maximum

714.7.2.1 Bulking Effect (ASTM [C29](#) Modified): The laboratory shall further report the quantitative effects of moisture content in the unit weight of the aggregate (bulking effect).

714.8 TEST CERTIFICATES AND REPORTS:

Test certificates and reports for the bituminous material shall be furnished in accordance with Section [711](#).

714.9 CONVERSION OF QUANTITIES:

Volumetric conversions shall be accomplished in accordance with Section [713](#).

- End of Section -

SECTION 715

SLURRY SEAL MATERIALS

715.1 GENERAL:

Slurry seal shall consist of a properly proportioned mixture of emulsified asphalt, mineral aggregate, mineral fillers, water, and additives (if necessary). Slurry seal is designed to provide skid resistant texture, improve surface friction and extend the service life of the existing pavement. Slurry seal shall be placed as a single layer with a minimum thickness greater than the nominal aggregate size specified in the mix design.

All material sources must be approved prior to their use. The Contractor shall submit a job mix formula and if requested pre-qualifications for materials at least seven (7) days prior to start of construction. When requested, additional samples shall be furnished during the construction period at no cost to the Agency. This is a non-pay item.

715.2 AGGREGATE:

715.2.1 Mineral Filler: Mineral filler shall consist of finely divided matter, such as hydrated lime, Portland cement, limestone dust or coal ash, conforming to the requirements of ASTM [D242](#). Mineral filler shall be used only when needed to reduce the setting time, to improve the workability, or to reduce the stripping characteristics of the aggregate emulsion mixture. The minimum amount of the required filler shall be used, and it shall be considered as part of the blended aggregate.

A certificate shall be submitted with the job mix formula demonstrating conformance to the requirements of ASTM [D242](#).

715.2.2 Mineral Aggregate: Coarse and fine aggregates shall be per Section [701](#). Mineral aggregates used shall be 100% crushed with no rounded particles. No natural sand shall be allowed. The use of recycled asphalt (RAP) may be used with prior approval of the Engineer. The mineral aggregate without mineral filler shall conform to the requirements specified in Table [715-1](#). Historical test data from source aggregate may be used, if tested within the past year.

Type I. This aggregate gradation is used to seal and fill minor surface voids.

Type II. This aggregate gradation is used to fill surface voids, address surface distresses, seal, and provide a durable wearing surface.

Type III. This aggregate gradation provides maximum skid resistance and an improved wearing surface. This type of surface is appropriate for heavily traveled pavements, or for placement on highly textured surfaces requiring larger size aggregate to fill voids.

If more than one kind of aggregate is used, the correct amount of each kind of aggregate needed to produce the required gradation shall be proportioned separately in a manner that shall result in a uniform and homogeneous blend. The final blended aggregate shall meet the requirements of Table [715-1](#).

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TABLE 715-1			
SLURRY SEAL AGGREGATE			
GRADATION TEST METHOD ASTM C136 / C117			
SIEVE SIZE	TYPE I % PASSING	TYPE II % PASSING	TYPE III % PASSING
3/8	100	100	100
No. 4	100	85-100	70-90
No. 8	90-100	65-90	45-70
No. 16	65-90	45-70	28-50
No. 30	40-60	30-50	19-34
No. 50	25-42	18-30	12-25
No. 100	15-30	10-21	7-18
No. 200	10-20	5-15	5-15
ASTM TEST METHOD	TEST		REQUIREMENTS
D2419	Sand Equivalent		50, minimum
D5821	Fractured Faces		100%
D4318	Plasticity Index		NP
C131	L.A. Abrasion		35 percent, maximum

The gradation of the aggregate stockpile shall not vary by more than the gradation band specification listed in Table 715-1.

715.3 WATER:

Water shall be potable water, free of any injurious impurities. The Contractor shall identify the water source to the Engineer.

715.4 ADDITIVES:

Additives may be used to accelerate or retard the breaking point and set times of the mix, or to improve the resulting finished surface.

The use of additives in the mix shall be supplied in quantities predetermined by the laboratory job mix formula.

715.5 BITUMINOUS MATERIAL:

The asphalt emulsion used for slurry seal shall meet the requirements specified in Section [713](#).

Each tank of emulsion produced shall be certified as to its compliance with these specifications; this certification shall include a certificate of analysis indicating the percent asphalt residue of each tank supplying emulsion to the project. This certificate of analysis shall accompany the placement machine and shall be provided to the Engineer upon request.

The quick setting emulsified asphalt shall be of the anionic or cationic quick set type such as QSH, CQSH, PMCQS-1h or LMCQS-1h that shall react to chemically active mineral fillers such as Portland cement in such a way that the applied slurry mixture can support controlled traffic in 45-60 minutes after application. The amount of chemically active filler shall be determined by job mix formula and field performance.

Slow setting emulsion may be used when traffic control is not a critical item.

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715.6 MODIFIER TYPE AND CONTENT:

Polymer solids or latex modified cationic quick setting emulsion (PMCQS-1h or LMCQS-1h) may be used when specified or approved by the Engineer.

Modified cationic quick setting emulsion (PMCQS-1h or LMCQS-1h), shall be homogeneous and the modifier used shall consist of either polymer solids milled or latex blended during the emulsification process. The PMCQS-1h or LMCQS-1h shall contain a minimum of 3% polymer solids or latex and shall conform to Section [713](#).

A certification of the polymer solids or latex content and type by the supplier shall be required throughout the duration of the contract. Each tank of emulsion produced shall be certified as to its compliance with these specifications; this certification shall include a certificate of analysis indicating the percent asphalt residue of each tank supplying emulsion to the project. This certificate of analysis shall accompany the placement machine and shall be provided to the Engineer upon request.

Placement of slurry seal is temperature dependent and should be tested under field conditions.

715.7 JOB MIX FORMULA:

715.7.1 General: The job mix formula shall be designed to provide a suitable surface for traffic conditions, climate and curing. All materials shall be pre-tested in the laboratory to determine their suitability for use in the slurry seal. The job mix formula shall be evaluated using a minimum of three emulsion contents to determine which emulsion content shall yield the optimum emulsion content that meets the requirement of [715-2](#).

The report must clearly show the theoretical recommended proportion of aggregate, mineral filler (Minimum & Maximum), water (Minimum & Maximum), additive(s), and asphalt based on the dry weight of aggregate.

The Contractor shall provide a job mix formula from an AASHTO resource accredited laboratory and present certified test results for the Engineer's approval. All the materials used in the job mix formula shall be representative of the materials proposed by the Contractor for use in the project. The job mix formula shall not be older than one (1) calendar year. A new job mix formula shall be required if any material changes are made to the original design.

All the products used in the construction shall have certifications from the suppliers, and these certifications shall be given to the Engineer upon delivery to the project.

Job mix formula and proportioning shall be approved by the Engineer prior to the start of the project.

715.7.2 Specifications: The specification limits are shown in Table [715-2](#).

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TABLE 718-1					
PRESERVATIVE SEAL SPECIFICATIONS					
Properties	Method	Type-1	Type-2	Type-3	Type-4
Test on residue by:		ASTM D244 Evaporation To 138°C	ASTM D244 Evaporation To 138°C	ASTM D244 Evaporation To 138°C	ASTM D244 Distillation To 177°C
Ductility, 25C, 5 cm/min, cm	ASTM D113			20 min	
Penetration, 25C, 100g/5 sec, dmm	ASTM D5			20-80	
Penetration, 4C, 200g/60 sec, dmm	ASTM D5				20-70
Kinematic Viscosity, 140°F, cSt	ASTM D2170	100-200	1,000-9,500		
Accelerated Weathering test ^(Note 5)	ASTM D4799			Plant certification within 12 months	
Test on		Evaporative Residue	Evaporative Residue		Rejuvenating Agent Base
Asphaltenes, % w	ASTM D2006	1.0 max	10.0 Max.		1.0 max
Maltene Dist. Ratio (PC+A ₁)/(A ₂ +S)	ASTM D2006	0.3-0.6	0.2-1.4		
PC/S Ratio	ASTM D2006	0.5 min	0.5 min.		
Saturated Hydrocarbons, S	ASTM D2006	28 max	28 max.		30 max
Kinematic Viscosity, 140°F, cSt	ASTM D2170				50-175
Flash point °F	ASTM D92				375 min
Test on residue from RTFO:	ASTM D2872				Rejuvenating Agent Base
Mass Change, %,	ASTM D2872				6.5 max
Kinematic Viscosity, 140°F, cSt	ASTM D2170				Report
Kinematic Viscosity, Ratio ^(Note 6)					3.0 max

Notes:

1. Brookfield viscosity using spindle #27 (ASTM [D4402](#)) test temperature at 140°F temperature equilibrate the sample for a minimum of 20 minutes. Sample test time is at 5 minutes inside the Brookfield viscosity tube.
2. Flash point on residue may be waived by the Engineer during production sampling and testing provided manufacturer submits results performed in the previous 12 months in compliance.
3. Viscosity in poise may be determined using AASHTO T-315 by converting the Complex Dynamic Shear Viscosity to Viscosity in poise.
4. Elastic Recovery molds shall have straight sides as shown in Fig. 1 of AASHTO T-301.
5. Other Accelerated Weathering test procedures may be presented for acceptance by the Engineer prior to project start. These results shall be provided at no additional cost to the agency.
6. Kinematic Viscosity Ratio will be determined by dividing the viscosity of the material after RTFO aging by the original viscosity.

SECTION 718

718.3 ASPHALT SURFACE SEALER:

Asphalt Surface Sealer: Asphalt Surface Sealer not diluted, and applied as per the manufacturer's specifications, shall conform to ASTM [D8099](#) noted in Table [718-2](#) and two additional requirements on the base asphalt used in preservative seal for flash and softening points.

TABLE 718-2		
ASPHALT SURFACE SEALER		
Properties	Method	Asphalt Surface Sealer
Uniformity	ASTM D2939	No separation, coagulation, or settlement that cannot be overcome by moderate stirring
Wet Film Continuity	ASTM D2939	Uniform homogenous consistency
Density @ 25C (77F) [lbs./gal]	ASTM D2939	Min 1.0 [9] Max 1.5 [12]
Water Content, %	ASTM D95	70% max
Ash content of residue, %	ASTM D2939	10% min 70% max
Drying time, firm set, hours	ASTM D2939	8 hours max
Resistance to heat	ASTM D2939	No blistering, sagging, or slipping
Resistance to water	ASTM D2939	No loss of adhesion and no blistering or tendency to re-emulsify
Flexibility	ASTM D2939	No flaking, cracking, or loss of adhesion to the substrate
Residue by Evaporation	ASTM D2939	30% min
<u>Tests on Base Asphalt Used in Preservative Seal Prior to Emulsification</u>	<u>Method</u>	<u>Asphalt Surface Sealer</u>
Flash Point (degrees F)	ASTM D92	450° F
Softening Point (degrees F)	ASTM D36	140° F min

718.4 SOLAR REFLECTIVE PAVEMENT COATINGS:

Solar Reflective Pavement Coatings shall be asphalt-based, polymer-based, or other materials applied to asphalt concrete surface for the purpose of pavement maintenance and urban heat mitigation. The material shall, at a minimum, meet the requirements of Table 718-2 and be applied per manufacturer's specification. Typical application rates are 0.22 to 0.28 gallons per square yard. The material shall have a minimum Solar Reflective Index (SRI) of 30 and a maximum SRI of 60, as measured in the laboratory prior to delivery. Lab SRI shall be measured by ASTM [E1980](#). Each supplier must submit a certified statement that the product meets the Lab SRI requirement.

- End of Section -

SECTION 725

PORTLAND CEMENT CONCRETE

725.1 GENERAL:

Portland cement concrete shall be composed of cementitious materials, fine and coarse aggregates, water, and, if specified or allowed, certain chemical admixtures and additives.

TABLE 725-1		
CONCRETE CLASSES - MINIMUM REQUIREMENTS		
Class of Concrete	Minimum Cementitious Materials Content (lbs. per cubic yard)	Minimum Compressive Strength * at 28 Days (psi)
AA	600	4000
A	520	3000
B	470	2500
C	420	2000
* In accordance with Section 725.8		

725.2 CEMENTITIOUS MATERIALS:

Hydraulic cement shall consist of either Portland cement or Blended Hydraulic cement.

Portland cement shall conform to the current revision requirements of ASTM [C150](#) for Type II for moderate sulfate resistance, Type III for high early strength, or Type V for high sulfate resistance, and shall not contain more than 0.60 percent total equivalent alkalis.

Blended hydraulic cement shall conform to the current revision requirements of ASTM [C595](#) for Portland Pozzolan cement Type IP (MS) for moderate sulfate resistance or (HS) for high sulfate resistance, Portland Limestone cement Type IL (MS) for moderate sulfate resistance or (HS) for high sulfate resistance, or Ternary Blended cement Type IT (MS) for moderate sulfate resistance or (HS) for high sulfate resistance.

Up to 25 percent by weight of the Table [725-1](#) minimum cementitious materials requirements may be an approved coal ash or natural pozzolan when the mix design incorporates C150 Portland cement of any Type or C595 Type IL Blended Limestone cement per Table [725-2](#). Additional coal ash or pozzolanic material in excess of the minimum Table [725-1](#) requirements may be incorporated into any concrete mix design to achieve enhanced performance, upon approval of the Engineer.

Supplementary Cementitious Materials (SCM) shall not be used as an additional cementitious materials replacement in concrete in combination with Portland Pozzolan cement Type IP or Ternary Blended cement Type IT without prior approval by the Engineer.

TABLE 725-2			
Cement Type ASTM C150/C595	Allowable Coal Ash or Natural Pozzolan (%)	Included Coal Ash or Natural Pozzolan (%)	Allowable Limestone (%)
Type II	≤ 25	—	≤ 5
Type III	≤ 25	—	≤ 5
Type V	≤ 25	—	≤ 5
Type IL(X) ^A	≤ 25	—	> 5 and ≤ 15
Type IP(X) ^B	—	≤ 25	—
Type IT(PX)(LX) ^C	—	≤ 25	≤ 15

Notes: (See following page.)

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- A) Type IL - Portland cement blended or interground with limestone.
(X) - the targeted percentage of limestone in the product expressed as a whole number by mass of the final blended product.
- B) Type IP - Portland cement blended or interground with coal ash or natural pozzolan.
(X) - the targeted percentage of coal ash or natural pozzolan in the product expressed as a whole number by mass of the final blended product.
- C) Type IT - Portland cement blended or interground with coal ash or natural pozzolan and limestone.
(PX) - where P stands for coal ash or natural pozzolan and X is the targeted percentage expressed as a whole number by mass of the final blended product.
(LX) - where L stands for limestone and X is the targeted percentage expressed as a whole number by mass of the final blended product.

Cementitious materials shall be stored in such manner as to permit ready access for the purpose of inspection and identification, and so as to be suitably protected against damage by contamination or moisture. Should any lot of bulk cementitious material be delivered to the site show evidence of contamination, the Engineer may require that such lot be removed from the site.

725.2.1 Supplementary Cementitious Materials (Pozzolans): Supplementary Cementitious Materials to be used in concrete or furnished under this specification shall conform to the appropriate ASTM requirements as follows:

Coal ash (such as fly ash or bottom ash) or natural pozzolan (raw or calcined)	ASTM C618 and C311
Silica Fume	ASTM C1240

Upon request, the Contractor shall obtain and deliver to the Engineer a Certification of Analysis or Certification of Compliance signed by the pozzolan supplier identifying the pozzolanic material and stating the pozzolan delivered to the batching site complies with the appropriate specifications. The cost of furnishing tested pozzolan shall be considered as included in the contract price and no additional allowance will be made therefore.

Pozzolanic materials shall be handled and stored in the same manner as other cementitious materials. When facilities for handling a bulk pozzolan are not available, the pozzolan shall be delivered in original unopened sacks bearing the name and brand of the supplier, the type and source of the pozzolan, and the weight contained in each sack plainly marked thereon.

725.3 AGGREGATES:

Coarse and fine aggregate shall conform to the applicable requirements of ASTM [C33](#). Coarse aggregate grading requirements shall conform to the appropriate rock size designation in the Grading Requirements for Coarse Aggregate, Table 3. Fine aggregate grading requirements shall conform to Section 6, Table 1.

The average value of three successive sand equivalent samples shall not be less than 70 when tested in accordance with ASTM [D2419](#). No individual sample shall have a sand equivalent less than 65.

The loss by abrasion in the Los Angeles Abrasion Machine, determined as prescribed in ASTM [C131](#), shall not exceed 10 percent, by weight, after 100 revolutions nor 40 percent after 500 revolutions.

Prior to the delivery of the aggregates and whenever required during concrete production, the Contractor shall make stockpiles available to the Engineer for testing. All required samples shall be furnished at the expense of the Contractor, and the cost of sampling and testing shall be at the expense of the Contracting Agency.

Reclaimed Concrete Materials (RCM) and Reclaimed Asphalt Pavement (RAP) as defined in Section [701](#) shall not be used in Portland Cement Concrete without the prior approval of the Engineer.

725.4 WATER:

The water used for mixing concrete shall be potable or shall meet the requirements of ASTM [C1602](#), when tested by a qualified independent testing laboratory.

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725.5 ADMIXTURES AND ADDITIVES:

Admixtures or additives of any type, except as otherwise specified, shall not be used unless identified in the approved mix design or authorized by the Engineer.

Water reducing admixtures incorporated into the approved concrete mix design shall meet the requirements of ASTM [C494](#) for the appropriate type.

Air entraining admixtures incorporated into the approved concrete mix design shall meet the requirements of ASTM [C260](#).

Pigments incorporated into the approved concrete mix design for integrally colored concrete shall meet the requirements of ASTM [C979](#).

Fibers incorporated into the approved concrete mix shall meet the requirements of ASTM [C1116](#).

Any admixtures used shall be included in the price for that item.

725.6 MIX DESIGN PROPORTIONING:

A concrete mix design carrying the producer's designated mix number for each type of concrete being furnished under these specifications shall be submitted to the Engineer every two years for approval. Each design shall utilize the proper proportioning of ingredients to produce a concrete mix that is homogeneous and sufficiently workable to provide a consistent and durable concrete product that meets the specified compressive strength and other properties as required by the application.

A concrete mix design submittal shall include the mix identification number and the applicable proportions, weights, and quantities of individual materials incorporated into the mix including the size and source of concrete aggregates, the type and source of cement and coal ash or SCM, and the brand and designation of chemical admixtures or other additives.

In the event there is a modification to the mix design proportions:

(A) Modifications that do not require a new mix design submittal/approval:

- (1) Modifications, which do not result in batch, target weights for the fine aggregate or combined coarse aggregates changing by more than 5 percent from the original approved mix design.
- (2) Modifications to the percentage of coarse aggregate fractions that do not change the total coarse aggregate volume.
- (3) Modifications to dosages of chemical or air-entraining admixtures, within the manufacturer's recommendations.
- (4) The incorporation or elimination of chemical admixtures, which are listed on the mix design to effect a change in the time-of-set (retarders or accelerators).

(B) Modifications that require a new mix design submittal/approval and may require performance verification:

- (1) Modification to the class of concrete per Table [725-1](#).
- (2) Modification to the type/class/source of cement, coal ash, natural pozzolan, or silica fume.
- (3) Modification to the percentage of coal ash, natural pozzolan, or silica fume.
- (4) Modification to a coarse aggregate size designation.
- (5) Modification of the type of chemical admixture, or the incorporation or elimination, of an air-entraining admixture.
- (6) Modification of coarse or fine aggregate source.

725.7 MIXING:

All proportioning/batching/mixing equipment shall comply with the standards of the Concrete Plant Manufacturer's Bureau and the certification requirements of the Arizona Rock Products Association or National Ready Mixed Concrete Association. The proportioning shall consist of combining the specified sizes of aggregates with cementitious materials, admixtures/additives, and water as herein provided. No method which may cause the segregation or degradation of materials, shall be used.

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Weighing and metering devices used for the purpose of proportioning materials shall fulfill requirements as to accuracy and tolerance prescribed by the Weights and Measures Division of the State of Arizona and shall be sealed and certified in accordance with the procedures established by this agency. This certification shall not be over 12 months old and shall be renewed whenever required by the Engineer. When portable plants are set up at a new or temporary location, the scales and scale assembly shall be inspected and certificate issued regardless of the date when the scales were last tested. The Engineer may require the Contractor to run a quick scale check at any time with certified weights furnished by the Contractor and order the scale recertified if necessary.

Any admixture/additive shall be measured accurately by mechanical means into each batch by equipment or in a method pre-approved by the Engineer.

The equipment for measuring and supplying the water in the mixer shall be so constructed and arranged that the amount of water to be added to the mixture can be measured, in gallons or by weight. The amount of water shall be varied in accordance with the percentage of free moisture in the material and the requirements of the workability of the aggregate. Machine mixing will be required in all cases unless pre-approved by the Engineer. Regardless of the method employed, mixing shall be commenced as soon as possible after the cementitious material is placed in contact with the aggregates or water. All concrete mixers shall be of such design and construction, and so operated, as to provide a thoroughly and properly mixed concrete in which the ingredients are uniformly distributed.

725.7.1 Paving and Stationary Mixers: Paving and stationary mixers shall comply with the standards of the Concrete Plant Manufacturer's Bureau and the certification requirements of the Arizona Rock Products Association or the National Ready Mixed Concrete Association. Mixers shall be maintained in proper and serviceable working condition, and any part or portion thereof that is out of order, or becomes worn to such extent as to detrimentally affect the quality of mixing, shall be promptly repaired or replaced.

The proper proportions of aggregate, cementitious materials, admixtures/additives and water for each batch of concrete shall be placed in the mixer, and shall be mixed for a period of not less than 50 seconds after all such materials are in the drum.

The rotating speed at which the mixer shall be operated shall conform to that recommended by the manufacturer.

The total volume of materials mixed in any one batch shall neither exceed the water level capacity of the mixer nor the manufacturer's catalog rated capacity of the mixer.

725.7.2 Transit Mixers: Transit mixers shall meet the requirements of the Truck Mixer Manufacturer's Bureau and the certification requirements of the Arizona Rock Products Association or the National Ready Mixed Concrete Association. Ready mix concrete shall comply with ASTM [C94](#) except as herein specified.

Each mixer and agitator shall have attached thereto in a prominent place a metal plate or plates, installed by the manufacturer, on which is plainly marked the capacity of the drum in terms of the volume of mixed concrete and the speed of rotation for the agitating and mixing speeds of the mixing drum or blades.

Each mixer shall have an identification number painted on the truck in such a location that it can be easily read from the batching platform.

The total volume of materials introduced into the mixer for mixing purposes shall not exceed the manufacturer's guaranteed mixing capacity. If the concrete so mixed does not meet the uniformity requirements of this section, the amount of materials charged into the mixer shall be reduced.

The rotation speed at which the mixer shall be operated shall conform to that recommended by the manufacturer.

Each batch of concrete placed in the mixer shall be mixed for not less than 70 nor more than 100 revolutions of the drum or blades, at the speed designated by the manufacturer of the equipment as mixing speed. Additional mixing shall be at the agitating speed designated by the manufacturer of the equipment. The revolving of the drum shall be continuous until the concrete is completely emptied from the drum. Before any portion of the materials for any batch of concrete is placed therein, the drum of the mixer shall be completely emptied of the previously mixed batch.

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At the time of delivery to the job site, the Engineer shall be provided with a legible delivery ticket that shall contain the following information:

- Date and Truck Number.
- Name of the Supplier.
- Name of the Contractor.
- Specific designation of job (name and location).
- Number of cubic yards in the batch.
- Time the transit mixer is loaded.
- Amount of water added at the job site at request of receiver, and his signature or initials.
- Suppliers' mix design code number.
- Type and amount of admixture or additive that is not already included in the approved mix design, if any.
- Serial number of the ticket.

Additional water may be added on the jobsite in accordance with ASTM [C94](#) Tolerances in Slump section to adjust slump providing the slump after such water addition does not exceed the maximum allowed by these specifications in Section [725.9](#)

(A) (1) and that water so added is mixed into the batch for a minimum of 30 additional revolutions at mixing speed. Loss of cement mortar during discharge, which in the opinion of the Engineer would be of sufficient amount to affect the homogeneity of the concrete, shall be cause for rejection of the load. The Contractor shall be responsible for all concrete to which water is added at the job site.

725.7.3 Job Mixed Concrete: All job mixed materials and procedures shall be pre-approved by the Engineer. A prepackaged commercial product shall be used for job mixed concrete placement in accordance with the manufacturer's recommended procedure.

In lieu of the use of a prepackaged commercial product, individual ingredients for concrete placement shall be prepared in a watertight container of suitable volume in batches not to exceed 1/3 cubic yard each. Proportioning of batches shall be in accordance with the applicable required mix design in Table [725-1](#) and Section [725.6](#). All mixing shall be done prior to placement in the forms and in accordance with the following procedure:

- (A) Mixing shall be done in a mechanical batch mixer of approved type.
- (B) The mixer shall be rotated at a speed recommended by the manufacturer.
- (C) Mixing shall continue for at least 1-1/2 minutes after all materials are in the mixer, unless a shorter time is shown to be satisfactory by the mixing uniformity tests of ASTM [C94](#).
- (D) Materials handling, batching, and mixing shall conform to the applicable provisions of ASTM [C94](#).
- (E) Suitable records shall be kept to identify the number of batches, proportions of materials used, and time and date of mixing and placement along with the approximate location in the structure.

725.7.4 Dry Batched Unmixed Concrete: All dry batched unmixed concrete materials and procedures shall be pre-approved by the Engineer. An accurate batch weight shall be provided to record the quantities of cementitious materials, aggregate, admixtures/additives, and water batched into the containers. The date of batching, the container number and the batching certificate number shall be recorded at the time of batching. Copies of the batch weight records shall be submitted to the Engineer upon request.

All dry batched unmixed concrete delivered to the job site shall be stored in containers so constructed that the cement cannot come in contact with the water and aggregate within the container. Any admixture/additive added in powder form shall be added to the cement; if added in liquid form, it shall be added to the water.

The contents of the container shall be discharged into a mixer at the job site. Following discharge of the first container into the mixer, the mixer shall be operated at mixing speeds during the discharge of the remaining containers. After the contents of the last container have been discharged into the mixer, the concrete shall be mixed as specified in this specification for transit mixers, and drum or turbine type mixers.

Any spillage of cementitious materials, aggregate, water or admixtures/additives during the filling, transporting, or the

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discharging of the container, shall be cause for rejection of the container or the contents of the mixer if any portion of the rejected container is discharged into the mixer.

725.7.5 Volumetric Batching and Continuous Mixing Concrete and Equipment: Volumetric-batching and continuous-mixing concrete and equipment may be utilized upon approval of the Engineer for job site concreting applications. Material handling, procedures, and operations shall be in accordance with ACI 304.6R, Guide for the use of Volumetric-Measuring and Continuous-Mixing Concrete Equipment and all concrete produced and all test performed shall be in accordance with ASTM [C685](#), Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing. All equipment shall meet the requirements of the Volumetric Mixer Standards of the Volumetric Mixer Manufacturers Bureau and shall have a suitable copyrighted rating plate furnished by the Bureau and attached to the volumetric mixing equipment.

725.8 TESTS AND TEST METHODS:

725.8.1 Field Sampling and Tests: Concrete shall be sampled in accordance with ASTM [C172](#) for determination of temperature, slump, unit weight and yield (when required) and air content (when required) as well as for fabrication of test cylinders for compressive strength determination at 28 days. Samples shall be of sufficient size to perform all the required tests and fabricate the necessary test cylinders but in no case less than 1 cubic foot. Concrete shall be sampled during discharge of the middle portion of the batch. At the discretion of the Engineer, a sample may be obtained at the beginning of the discharge if the properties of the concrete do not appear to be within the specification limits for slump or temperature.

All sampling and testing shall be done by a certified technician meeting the requirements of the ACI Concrete Field Testing Technician, Grade I or equivalent.

Temperature of the concrete mixture shall be determined in accordance with ASTM [C1064](#).

Slump of the concrete mixture shall be determined in accordance with ASTM [C143](#).

Air content of the concrete mixture (when required) shall be determined in accordance with ASTM [C231](#) or [C173](#), whichever is applicable.

Unit weight and yield of the concrete mixture (when required) shall be determined in accordance with ASTM [C138](#).

All compressive strength test specimens shall be made, cured, handled, protected, and transported in accordance with the requirements of ASTM [C31](#). The contractor shall provide and maintain for the sole use of the testing laboratory/technician adequate facilities for safe storage and proper curing of concrete test cylinders on the project site including sufficient access on weekends and holidays to allow the timely pick-up of cylinders specimens. Any and all deviations from the standard procedure of any test method shall be promptly identified and corrected. Any deviations shall be clearly noted by the testing laboratory on all written reports. Testing results obtained from non-standard testing procedures shall be considered invalid and discarded by Engineer.

Sampling and testing performed for concrete acceptance will be at the expense of the Contracting Agency. Sampling and testing for the Contractor's purposes of quality control or other needs shall be at the Contractor's expense.

725.8.2 Concrete Cylinder Test: A cylinder strength test shall be the average of the strengths of at least two 6 inch by 12 inch cylinders or at least two 4 inch by 8 inch cylinders made from the same sample of concrete and tested at 28 days. An adequate number of cylinder specimens shall be made for each 50 cubic yards or not less than each half-day's placement of each class of concrete. All specimens will be tested in a laboratory approved by the Engineer in accordance with ASTM [C39](#) for concrete acceptance. Should an individual cylinder show evidence of improper sampling, molding, curing, or testing, the results shall be discarded and the compressive strength shall be the result of the average of the remaining cylinder(s). Additional cylinder specimens may be made and tested at other ages to obtain additional compressive strength information and shall not be considered as acceptance tests. Cylinder testing performed for concrete acceptance will be at the expense of the Contracting Agency. Cylinder testing for the Contractor's purposes of quality control or other needs shall be at the Contractor's expense.

725.8.3 Additional Concrete Testing: If the 28-day strength test does not meet the compressive strength requirements, additional concrete testing may be performed to further evaluate the concrete in question for purposes of acceptability or

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payment. This may involve testing of additional cylinders at later ages, (for example - hold cylinders at 56 days or more), or core testing to determine in-place concrete strengths. This additional testing and all coring repairs shall be pre-approved by the Engineer and at the expense of the Contractor. If core testing is performed, at least three representative cores shall be obtained, conditioned and tested in accordance with ASTM [C42](#) from each concrete member or area of concrete to be tested at locations designated by the Engineer. Cores damaged subsequent to or during removal shall be rejected and additional core samples taken. Cores shall be obtained and delivered to a laboratory acceptable to the Engineer in time to allow complete strength testing within 48 days of original concrete placement. The Contractor may elect to have a representative present during sampling and testing. A core strength test shall be the average of the results of the three cores. Should an individual core show evidence of improper sampling, curing, or testing, the results shall be discarded and the compressive strength shall be the result of the average of the remaining core(s). Results of the core strength testing shall replace the results of the cylinder strength test for that sample.

725.9 ACCEPTANCE:

(A) Plastic Concrete Properties:

- (1) The slump of the concrete shall meet the requirements of ASTM [C94](#) Tolerances in Slump section. When the approved mix design or project specification requirements for slump are a “maximum” or “not to exceed”, the following tolerances apply:

Specified slump:	If 3” or less	If more than 3”
Plus tolerance	0 inch	0 inch
Minus tolerance	1 1/2 inch	2 1/2 inch

When the approved mix design or project specification requirements for slump are not written as a “maximum” or “not to exceed,” the following tolerances apply:

For design slump of:	Tolerance
2 inch and less	+/- 1/2 inch
More than 2 through 4 inch	+/- 1 inch
More than 4 inch	+/- 1 1/2 inch

- (2) Limit the maximum allowable temperature of the concrete mixture immediately before placement to 95°F unless otherwise specified or unless a higher allowable temperature is pre-approved by the Engineer. At the discretion of the Engineer, recommended practices in ACI 305, Specification for Hot Weather Concreting, can provide good reference information and may be used to modify maximum allowable concrete temperature and acceptance.

Per ACI 306, Specification for Cold Weather Concreting, when the atmospheric temperature at the time of placing concrete is above 30°F the temperature of the concrete, as placed, shall not be less than 60°F. When the atmospheric temperature at the time of placing concrete is between 0°F and 30°F the temperature of the concrete, as placed, shall not be less than 65°F.

- (3) Air entrained concrete shall meet the requirements of ASTM [C94](#) Air-Entrained Concrete section. The air content of air-entrained concrete when sampled from the transportation unit at the point of discharge shall be within the approved mix design tolerance or +/- 1.5 % of the specified value. When a representative sample taken prior to discharge shows an air content below the specified level by more than the allowable tolerance, additional air entraining admixture shall be added to the concrete mix to achieve the desired air content level, followed by a minimum of 30 revolutions at mixing speed.

- (4) Per ASTM [C94](#) Mixing and Delivery section, discharge of the concrete shall be completed within 1 1/2 hours (90 minutes) after the introduction of the mixing water to the cementitious materials or the introduction of the cementitious materials to the aggregates. The Engineer may allow the continuation of concrete placement after the 1 1/2 hours (90 minutes) time limit has been reached if the concrete is of such slump or workability that it can be placed without the addition of water to the batch. The 1 1/2 hours (90 minutes) time limit may also be waived if the mix design incorporates a hydration stabilizing admixture at the sufficient dosage to slow down hydration in order to permit additional transit/placement time. The dosage and associated additional time shall be noted on the delivery ticket. The additional

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discharge time shall not exceed the maximum additional time based on the dosage noted on the approved mix design or delivery ticket. It is the Contractor's responsibility to obtain approval for additional discharge time from the Engineer prior to concrete placement.

Any concrete failing to meet the tolerances for plastic concrete properties in 725.9 (A) (1) through (4) shall be reviewed by the Engineer and is subject to rejection.

(B) Hardened Concrete Properties – Compressive Strength:

Compressive strength of concrete shall be determined on the basis of cylinder strength tests obtained in accordance with Section [725.8.2](#) and shall be acceptable if the tests meet or exceed the minimum specified strength. When the validity of cylinder strength tests are suspect, the strength of concrete in question shall be determined in accordance with Section [725.8.3](#).

When compressive strength test results are less than the specified minimum, an Engineering Analysis to determine the impact of the strength reduction may be required by the Engineer prior to the decision to accept or reject the concrete. The Engineering Analysis will be at the Contractor's expense. Any concrete that is rejected by the Engineer shall be removed and replaced by the Contractor at the Contractor's expense.

When concrete is accepted by the Engineer on the basis of test results of less than 100% of the required minimum compressive strength, an adjustment in the concrete unit price may be made for the quantity of concrete represented by such strength tests in accordance with Table [725-3](#).

TABLE 725-3			
Adjustment in Concrete Unit Price Based on Strength Deficiency			
Class AA and Class A		Class B and Class C	
Percent of Specified Minimum 28-day Compressive Strength Attained (Nearest 1%)	Percent of Concrete Unit Price Allowed	Percent of Specified Minimum 28-day Compressive Strength Attained (Nearest 1%)	Percent of Concrete Unit Price Allowed
100% or greater	100	100% or greater	100
98-99	90	95-99	95
96-97	85	90-94	90
95	80	85-89	85

- End of Section -

SECTION 728

CONTROLLED LOW STRENGTH MATERIAL

728.1 GENERAL:

Controlled Low Strength Material (CLSM) is a mixture of cementitious materials, aggregates, admixtures\additives, and water that, as the cementitious materials hydrate, forms a soil replacement. CLSM is a self-compacting, flowable, cementitious material primarily used as a backfill, structural fill, or a replacement for compacted fill or unsuitable native material. Placement and usage of each type of CLSM is described in Section [604](#).

728.2 MATERIALS:

Cementitious materials shall conform to Section [725.2](#).

Coarse aggregate shall conform to ASTM [C33](#) grading size No. 57. The size and gradation of fine aggregates (sand) shall conform to ASTM [C33](#). Alternate materials meeting the applicable requirements of Section [701](#) or [702](#) such as combinations of other aggregates, Aggregate Base Course (ABC) or Reclaimed Concrete Material (RCM) may be used to replace the required coarse and fine aggregate as long as the approved mix design meets the requirements of Table [728-1](#) and is approved by the Engineer.

Water shall conform to Section [725.4](#)

728.3 PROPORTIONING OF MIXTURES AND PRODUCTION TOLERANCES:

Proportioning of the mixture shall comply with Section [725.6](#) and Table [728-1](#). The CLSM shall have consistency, workability, plasticity, and flow characteristics such that the material when placed is self-compacting. A minimum of 40% coarse aggregate shall be used. A mix design shall be submitted for the Engineer's approval prior to the excavation for which the material is intended for use. Sampling shall be in accordance with ASTM [D5971](#). The flow consistency shall be tested in accordance with ASTM [D6103-04](#). Unit weight (when applicable) shall be obtained by ASTM [D6023](#). Compressive strength shall be tested in accordance with ASTM [D4832](#).

TABLE 728-1	
CONTROLLED LOW STRENGTH MATERIAL REQUIREMENTS	
Portland Cement Content, Sack/cu yd.	Flow, inches
1/2 Sack	9±2
1 Sack	9±2
1 1/2 Sack	9±2
2 Sack	9±2

Notes for Table [728-1](#):

- (1) CLSM mixes meeting the table requirements will not generally be placeable by means of a concrete pump or may not provide the needed workability for certain conditions. When pumpable mixes or increased workability is required, the addition of coal ash or a natural pozzolan in excess of the required Portland Cement Content may be used.
- (2) Ready-mixed structural concrete or grout shall not be used in lieu of CLSM without prior approval from the Engineer and shall be subject to rejection.

728.4 MIXING:

CLSM mixing shall comply with Section [725.7](#). Mixing shall continue until the cementitious material and water are thoroughly dispersed throughout the material. Mixes shall be homogenous, readily placeable and uniformly workable.

- End of Section -

SECTION 729

EXPANSION JOINT FILLER

729.1 PREMOLDED JOINT FILLER:

Expansion joint filler materials shall consist of preformed strips of a durable resilient compound and comply with one of the following as specified by the Contracting Agency or as approved by the Engineer.

- (a) ASTM [D1751](#) – Performed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- (b) ASTM [D8139](#) – Semi-Rigid, Closed-Cell Polypropylene Foam, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction
- (c) ASTM [D1752](#) – Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
- (d) ASTM [D2628](#) – Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

729.2 POUR TYPE JOINT FILLERS FOR PORTLAND CEMENT CONCRETE PAVING (PCCP):

Pour type joint fillers shall comply with ASTM [D3406](#) or as approved by the Engineer. Joint sealant shall not contain any coal tar materials. The following requirement shall be added to paragraphs 7.1 of ASTM [D3406](#): The minimum ambient temperature during application and ambient temperatures under various storage conditions shall be clearly marked on the container.

729.3 TEST REPORT AND SHIPMENT CERTIFICATE:

When requested by the Engineer, each shipment shall be accompanied by a Certificate of Compliance that the material complies with the above specifications.

- *End of Section* -

SECTION 771

GALVANIZING

771.1 GENERAL:

Materials shall be hot-dip galvanized and the weight and uniformity of coating determined in accordance with the standard specifications given in Table [771-1](#).

TABLE 771-1		
GALVANIZING SPECIFICATIONS		
Material	ASTM Spec.	Wt. of Coating Oz./Sq. Ft. (Min.)
Corrugated Metal Pipe	A929	1.80
Flat Steel or Iron Sheets	A653 , A924	1.25
Iron or Steel Wire	A116	.80
Chain Link Fabric	A392	1.20
Barbed Wire	A121	.50
Steel Pipe - Rails and Posts	A53	1.8
	F1043 IA	1.8
	F1043 IC Galvanized After Forming	0.9 oz. w/chromate and organic clearcoat
Structural Shapes, Tie Rods, Ornamental Iron Railings, Handrails, and Curb Armor	A123	2.00
Bolts, Nuts, Washers, Anchor Bolts, Packing Spools, Gray Iron and Malleable Iron Castings and Steel Castings	A153	1.25

771.2 WORKMANSHIP:

The galvanizing shall be applied in such a manner that the spelter will not peel off. The finished product shall be free from blisters and excess spelter, and the coating shall be even, smooth, and uniform throughout. Machine work, die work, cutting, punching, bending, welding, drilling, thread cutting and other fabricating shall all be done as far as is practicable before the galvanizing. No member shall be galvanized which is out of alignment. All members (nuts, bolts, washers, etc.) shall be galvanized before a structural unit is assembled. All uncoated spots or damaged coatings due to poor workmanship, rough handling, or any other reason shall be cause for rejection.

771.3 TEST COUPONS:

Test coupons for determining the quality of the galvanizing shall be wired to the materials to be galvanized before immersion in such a manner as to represent the amount of coating deposited on the materials.

771.4 REPAIR OF GALVANIZED SURFACES:

Unless otherwise specified, where galvanized surfaces are field or shop cut, broken, burned or abraded, thus breaking the galvanizing, the locations thus damaged shall be repaired to the satisfaction of the Engineer with zinc dust-zinc oxide coating conforming to AASHTO M-36.

- End of Section -

SECTION 772

CHAIN LINK FENCE

772.1 GENERAL:

All material shall be new and, upon request, the Contractor shall furnish to the Contracting Agency, a certification of inspection stating that the materials have been manufactured, sampled, tested and inspected so as to meet the requirements for its type as specified below.

772.2 POSTS, RAILS AND BRACES:

Posts, rails and braces shall be constructed of pipe in conformance with types A, B or C below. Unless specifically designated by type in the plans or specifications, the Contractor may utilize any of the three types. The posts and rails in this section will cover fencing up to 12 feet in height with post spacing not to exceed 10 feet. The nominal outside dimensions and minimum weights shall be in accordance with Table [772-1](#). The manufacturer or his representative shall legibly mark each length of pipe by rolling, stamping or stenciling to identify the product by product name, ASTM standard, etc. and the country of manufacture.

Type A: Shall be manufactured in conformance to ASTM [F1043](#) IA-2 black steel pipe, welded or seamless, hot-dipped zinc coated, plain end, standard weight (schedule 40). The hot-dipped zinc coating (galvanized) shall be applied both inside and outside with not less than 1.8 oz. per square foot ± 0.1 oz.

Type B: Shall be manufactured in conformance to ASTM [F1043](#) IC Galvanized After Forming. Steel used in the manufacturing of the pipe shall be hot-rolled strip steel in compliance with ASTM [A1011](#) having a minimum yield strength of 50,000 psi. The pipe will be manufactured by electric welded cold-formed process per ASTM [A500](#). The exterior surface will be triple coated and the interior surface single coated. The triple coated external surface shall be hot-dipped zinc coated (galvanized) having a weight of not less than 1.0 oz. per square foot ± 0.1 oz., followed by a chromate conversion coating, having a weight not less than 1.05 micro ounces per square foot ± 0.353 micro ounces (30 micrograms per square inch ± 15 micrograms) and an acrylic coating having a thickness of 0.0005 inches ± 0.0002 inches. The internal surface shall be coated with a zinc base paint having a 90% zinc powder loading and having a minimum thickness of 0.0005 inches.

Type C: Shall be manufactured in conformance to ASTM [F1043](#) IC Galvanized Before Forming. Steel used in the manufacturing of the pipe shall be strip steel in compliance with ASTM [A653](#) Grade D having a minimum yield strength of 50,000 psi. Both sides of the strip shall be hot-dipped zinc coated (galvanized) per ASTM [A653](#) and A-924 having the weight of not less than 1.0 oz. per square inch ± 0.1 oz. The zinc coating will form the first coat of a triple coated external surface and the final coat of the interior surface. The pipe will be manufactured by electric welded cold formed process per ASTM [A789](#). After manufacturing, the final two external coatings shall be a chromate conversion having a weight of not less than 1.05 micro ounces per square inch ± 0.353 micro ounces and an acrylic coating having a thickness of 0.0005 inches ± 0.0002 inches.

772.3 CHAIN LINK FABRIC:

Chain link fabric shall conform to the requirements of ASTM [A392](#) (Zinc-Coated) or ASTM [A491](#) (Aluminum-Coated). The coating process must leave the fabric completely free of barbs, icicles, or other projections that might be hazardous. The wire used in the manufacture of the fabric shall be 11 gage for all fence 60 inches or less in height and shall be 9 gage for all fence over 60 inches in height unless otherwise specified.

All chain link fabric shall be woven into approximately 2 inch mesh. Fabric less than 60 inches wide shall have knuckled finish on the top edge, and twisted and barbed finish on the bottom edge. Fabric 60 inches or greater in width shall have twisted and barbed finish on both edges. Barbing shall be done by cutting the wire on the bias.

772.4 TENSION WIRES AND FABRIC TIES:

Tension wires shall be at least 7 gage galvanized coil spring steel wire per ASTM [A824](#). Ties used to fasten the fabric to posts, rails, and gate frames shall be not smaller than 11 gage galvanized steel, 6 gage aluminum wire, or approved non-corrosive metal bands.

UNIFORM STANDARD DETAILS for PUBLIC WORKS CONSTRUCTION

SPONSORED and DISTRIBUTED by the



**2024 Revision to the
2020 EDITION
ARIZONA**

FOREWORD

Publication of these Uniform Standard Specifications and Details for Public Works Construction fulfills the goal of a group of agencies who joined forces in 1966 to produce such a set of documents. Subsequently, in the interest of promoting countywide acceptance and use of these standards and details, the Maricopa Association of Governments accepted their sponsorship and the responsibility of keeping them current and viable.

These specifications and details, representing the best professional thinking of representatives of several Public Works Departments, reviewed and refined by members of the construction industry, were written to fulfill the need for uniform rules governing public works construction performed for Maricopa County and the various cities and public agencies within Maricopa County who could not afford to promulgate such standards for themselves. Agencies in other regions or climes that desire to use these specifications may need to make adjustments for local conditions.

A uniform set of specifications and details, updated and embracing the most modern materials and construction techniques will reduce conflicts, provide clarity and lower construction costs for the benefit of the public.

Use of these standards for projects outside of the right-of-way should be reviewed by professional engineers and architects and applied with care to insure relevance to the planned work.

Specifications and details should be incorporated into project plans and specifications after careful review by the design engineer or architect of specific project needs. Not all specifications contained herein will apply to all projects. Prepared plans and specifications should clearly call out only those specific uniform specifications and details required for the project.

Uniform specifications and details are not a substitute for good engineering judgment. Unique conditions will arise that are outside the scope of these standards. When this happens, professional engineers and architects are required to use their judgment to amend these standards to best meet site-specific project needs in accordance with the rules set forth by the State of Arizona and policy statements made by the Arizona State Board of Technical Registration.

The Uniform Standard Specifications and Details for Public Works Construction are revised periodically and reprinted to reflect the changing technology of the construction industry. To this end a Specifications and Details Committee has been established as a permanent organization to continually study and recommend changes to the Specifications and Details. Interested parties may address suggested changes and questions to:

Standard Specifications & Details Committee

c/o Maricopa Association of Governments

302 North First Avenue, Suite 300

Phoenix, Arizona, 85003

Suggestions will be reviewed by the committee and appropriate segments of the construction industry and revisions will be published the first of each year. A copy of this publication is available for review on the internet at the website listed below. Please follow the links to the publications page and look for Uniform Standard Specifications for Public Works Construction and/or Uniform Standard Details for Public Works Construction: www.azmag.gov

In the interest of regional uniformity, it is hoped that all using agencies will adopt these standards with minimal changes. It is recognized that because of charter requirements and for other reasons, some agencies will find it necessary to modify or supplement certain requirements. In the interest of regional uniformity, it is strongly recommended that using agencies bring desired modifications to the MAG Committee for consideration and inclusion into these standards.

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205	2006	PAVED TURNOUTS
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225	2016	CONCRETE PAVERS
226-1	2022	CURB CUT TYPE 1
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228	2021	PERVIOUS CONCRETE PAVEMENT
230	2023	SIDEWALKS
234	2012	CURB MODIFICATION AT DETECTABLE WARNING
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236-4	2018	25'-35' R - RADIAL COMBINATION CURB RAMP
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237-1	2018	25'-35' R - DIRECTIONAL CURB RAMP - ATTACHED SIDEWALK
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303-1	2019	JOINT RESTRAINT FOR DUCTILE IRON AND POLYETHYLENE WRAPPED DUCTILE IRON AND PVC WATER PIPES (DRAWING)
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502-2	2004	TRASH RACK
503	2018	IRRIGATION STANDPIPE
504	1998	CONCRETE BLOCK JUNCTION BOX
505	2021	CONCRETE COLLAR FOR PIPE
506	1998	IRRIGATION VALVE INSTALLATION
507	2017	ENCASED CONCRETE PIPE (FOR SHALLOW INSTALLATION)
510	1998	CORRUGATED METAL PIPE AND INSTALLATION

500 SERIES: IRRIGATION AND STORM DRAIN INFORMATION (CONT.)

Detail	Revised	Title
520	1998	STORM DRAIN MANHOLE BASE (48" AND SMALLER)
521	1998	STORM DRAIN MANHOLE BASE (51" OR LARGER)
522	2015	STORM DRAIN MANHOLE SHAFT
523-1	1998	PRESSURE MANHOLE
523-2	1998	PRESSURE MANHOLE
524	1998	STORM DRAIN LATERAL PIPE CONNECTIONS
530	1998	3'-6" CURB OPENING CATCH BASIN - TYPE 'A'
531	1998	5'-6" CURB OPENING CATCH BASIN - TYPE 'B'
532	1998	8'-0" CURB OPENING CATCH BASIN - TYPE 'C'
533-1	1998	CATCH BASIN TYPE 'D'
533-2	1999	APRON FOR TYPE 'D' CATCH BASIN
533-3	2007	FRAME AND GRATE FOR TYPE 'D' CATCH BASIN
533-4	2007	7'-0" CURB OPENING CATCH BASIN TYPE 'D' - GRATE DETAILS
534-1	1998	CATCH BASIN TYPE 'E'
534-2	1998	CATCH BASIN TYPE 'E' (DETAILS)
534-3	1998	CATCH BASIN TYPE 'E' (DETAILS)
534-4	2023	CATCH BASIN TYPE 'E' (DETAILS)
534-5	1998	ALTERNATE GRATE STYLES, SUMP LOCATION
535	2009	CATCH BASIN TYPE 'F' (FOR USE WITHOUT CURB)
536-1	1999	COMMON DETAILS AND SECTIONS FOR CURB OPENING CATCH BASINS
536-2	1998	ALTERNATIVE COVER FOR CURB OPENING CATCH BASINS
537	2002	CATCH BASIN TYPE 'G'
538	1998	CATCH BASIN TYPE 'H'
539	1998	GRATES FOR CATCH BASINS, TYPE G AND H
540-1	1998	CATCH BASIN GRATES
540-2	1998	CATCH BASIN GRATES
541	2005	CATCH BASIN SUBGRADE DRAIN
542-1	2022	CURB OPENING CATCH BASIN WITH SIDEWALK (3' - 17' WING) TYPE 'I'
542-2	2022	CURB OPENING CATCH BASIN WITHOUT SIDEWALK (3' - 17' WING) TYPE 'I'
545	1998	END SECTION - REINFORCED CONCRETE PIPE
550	2021	SPILLWAY INLET AND OUTLET
552 *	2015	FORD CROSSING WITH CUT-OFF WALLS
555	2010	EROSION PROTECTION/GABIIONS

DETAIL NO.

100-2STANDARD DETAIL
ENGLISH**INDEX (PAGE 2 OF 3)*** NEW OR
REVISED.

REVISED

01-01-2024

DETAIL NO.

100-2

600 SERIES: LANDSCAPING AND LANDSCAPE IRRIGATION

Detail	Revised	Title
601-1	2023	DOUBLE STAKE TREE 5 GAL., 15 GAL., 24" BOX
601-2	2023	DUAL STAKE TREE ON SLOPE 5 GAL., 15 GAL., 24" BOX
601-3	2023	TRIPLE STAKE TREE 36" BOX OR GREATER
601-4	2023	MULTI-TRUNK TREE 24" BOX OR GREATER
601-5	2023	TREE STAKING AND GUYING (SINGLE TRUNK)
601-6	2023	TREE STAKING AND GUYING (MULTIPLE TRUNK)
603-1	2023	SHRUB PLANTING
603-2	2023	SHRUB PLANTING ON SLOPE
603-3	2023	GOUNDCOVER PLANTING
603-4	2023	VINE PLANTING
603-5	2023	SAGUARO PLANTING WITH WOOD BRACES
603-6	2023	OCOTILLO PLANTING CONTAINER STOCK
603-7	2023	AGAVE PLANTING BARE ROOT
603-8	2023	CACTUS/SUCCULENT PLANTING CONTAINER STOCK
603-9	2023	PALM PLANTING BARERoot
607-1	2023	DECOMPOSED GRANITE
607-2	2023	BOULDER INSTALLATION
607-3	2023	CONCRETE HEADER
609-1	2023	ROOT BARRIER
611-1	2023	BACKFLOW PREVENTER ASSEMBLY (2" DIA. & SMALLER)
611-2	2023	BACKFLOW PREVENTER ASSEMBLY (2 1/2" DIA. OR LARGER)
611-3	2023	ENCLOSURE CAGE FOR BACKFLOW PREVENTER
612-1	2023	PIPE AND WIRE TRENCHING
612-2	2023	SLEEVE TRENCHING
613-1	2023	GATE VALVE 2-1/2" AND LARGER ASSEMBLY
613-2	2023	ISOLATION VALVE 2" & SMALLER ASSEMBLY
613-3	2023	QUICK COUPLER VALVE ASSEMBLY
613-4	2023	FLOW SENSOR
613-5	2023	REMOTE CONTROL VALVE ASSEMBLY
613-6	2023	DRIP REMOTE CONTROL VALVE & PRESSURE REDUCTION ASSEMBLY
613-7	2023	PRESSURE REGULATOR ASSEMBLY
613-8	2023	AIR DECREASE VALVE ASSEMBLY
614-1	2023	ROOT ZONE WATERING EMISSION DEVICE
614-2	2023	MULTI-OUTLET EMITTER ASSEMBLY
614-3	2023	SINGLE-OUTLET DRIP EMITTER ASSEMBLY
614-4	2023	MANUAL FLUSH VALVE INSTALLED IN BOX
615-1	2023	POP-UP HEAD ROTOR TYPE (4" & 6")
615-2	2023	POP-UP HEAD ROTOR TYPE (12")
615-3	2023	POP-UP HEAD SPRAY TYPE (4" & 6")
615-4	2023	POP-UP HEAD SPRAY TYPE (12")
616-1	2023	IRRIGATION CONTROLLER WALL MOUNT INTERIOR
616-2	2023	IRRIGATION CONTROLLER IN ENCLOSURE
616-3	2023	SOLAR POWERED CONTROLLER
617-1	2023	WIRE CONNECTOR
617-2	2023	CABLE WIRE SPLICE

DETAIL NO.

100-3STANDARD DETAIL
ENGLISH**INDEX (PAGE 3 OF 3)*** NEW OR
REVISED.

REVISED

01-01-2023

DETAIL NO.

100-3

PAGE RESERVED FOR FUTURE USE.

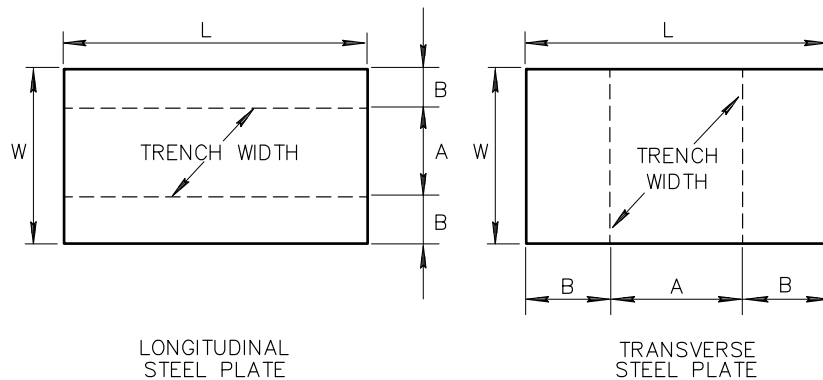
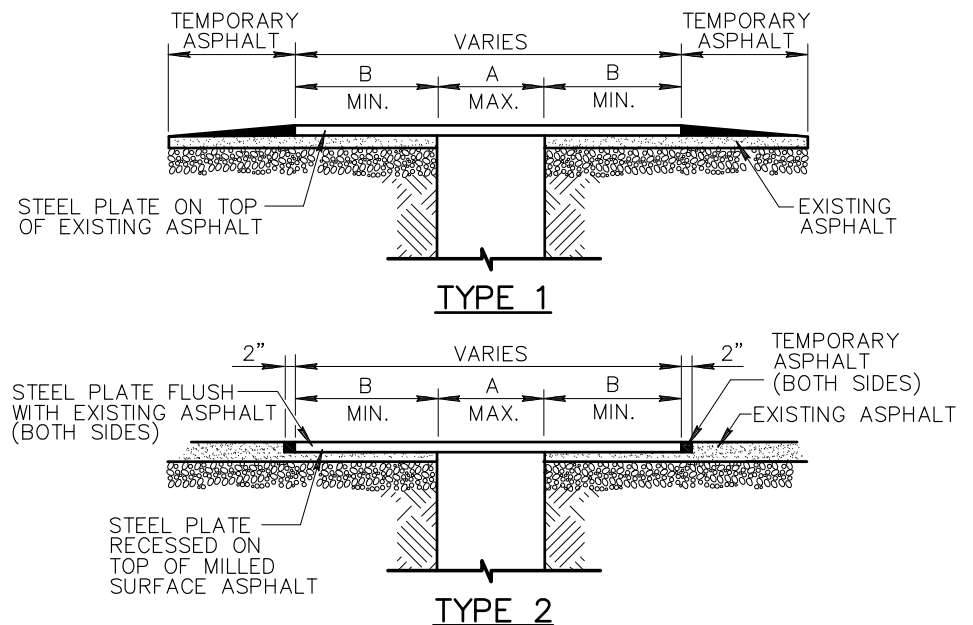


PLATE SIZE						
LONGITUDINAL					TRANSVERSE	
(A)	(B)	THICKNESS	(W)	(L)	(A)	(B)
12"	18"	1"	4'	8'	58"	19"
12"	18"	1"	4'	10'	58"	31"
24"	18"	1"	5'	10'	70"	25"
36"	18"	1"	6'	10'	44"	38"
48"	18"	1"	7'	10'	52"	34"
60"	18"	1"	8'	10'	58"	31"
12"	18"	1-1/4"	4'	15'	88"	47"
24"	18"	1-1/4"	5'	12'	104"	20"
36"	18"	1-1/4"	6'	12'	66"	39"
36"	18"	1-1/4"	6'	16'	66"	63"
48"	18"	1-1/4"	7'	12'	76"	33"
48"	18"	1-1/4"	7'	16'	76"	58"
60"	18"	1-1/4"	8'	12'	86"	29"
60"	18"	1-1/4"	8'	15'	86"	47"
60"	18"	1-1/4"	8'	16'	86"	63"
60"	18"	1-1/4"	8'	20'	86"	77"
60"	18"	1-3/8"	8'	20'	102"	69"

NOTES:

1. USE TYPE 1 PLATE INSTALLATION WHERE POSTED SPEED LIMIT IS LESS THAN 30 MPH. USE TYPE 2 PLATE INSTALLATION WHERE POSTED SPEED LIMIT IS 30 MPH OR GREATER.
2. FOR TYPE 2 PLATE INSTALLATION, THE STEEL PLATE SHALL BE RECESSED BY MILLING INTO THE EXISTING ASPHALT TO SET FLUSH WITH THE SURFACE OF THE EXISTING ASPHALT. FULL DEPTH CUTTING OF PAVEMENT SECTION OUTSIDE OF TRENCH IS NOT PERMITTED. MILLING DEPTH SHALL MATCH THICKNESS OF PLATE. THE GAP BETWEEN THE EDGE OF THE PLATE AND THE ADJACENT EXISTING ASPHALT PAVEMENT MUST BE FILLED WITH TEMPORARY ASPHALT.
3. TRENCH WIDTHS ARE BASED ON AN ANALYSIS PER THE 14TH EDITION OF STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES BY AASHTO. AN ASSUMED AXLE LOADING OF 12 TONS WITH A 30% IMPACT FACTOR WAS USED. THE AXLE LENGTH IS 6 FEET; THEREFORE THE NUMBER OF WHEELS CARRIED BY A PLATE DEPENDS ON THE ROADWAY WIDTH.
4. STEEL PLATE MUST BE ABLE TO WITHSTAND H-20 TRAFFIC LOADINGS WITHOUT ANY MOVEMENT.
5. PLATES SHALL BE FABRICATED FROM ASTM A36 STEEL (MIN).
6. PLATES SHALL BE SECURED FROM LATERAL MOVEMENT AND VERTICAL VIBRATION (ASSOCIATED NOISE) WHILE IN USE BY TEMPORARY ASPHALT (COLD MIX.)



DETAIL NO.

211



STANDARD DETAIL
ENGLISH

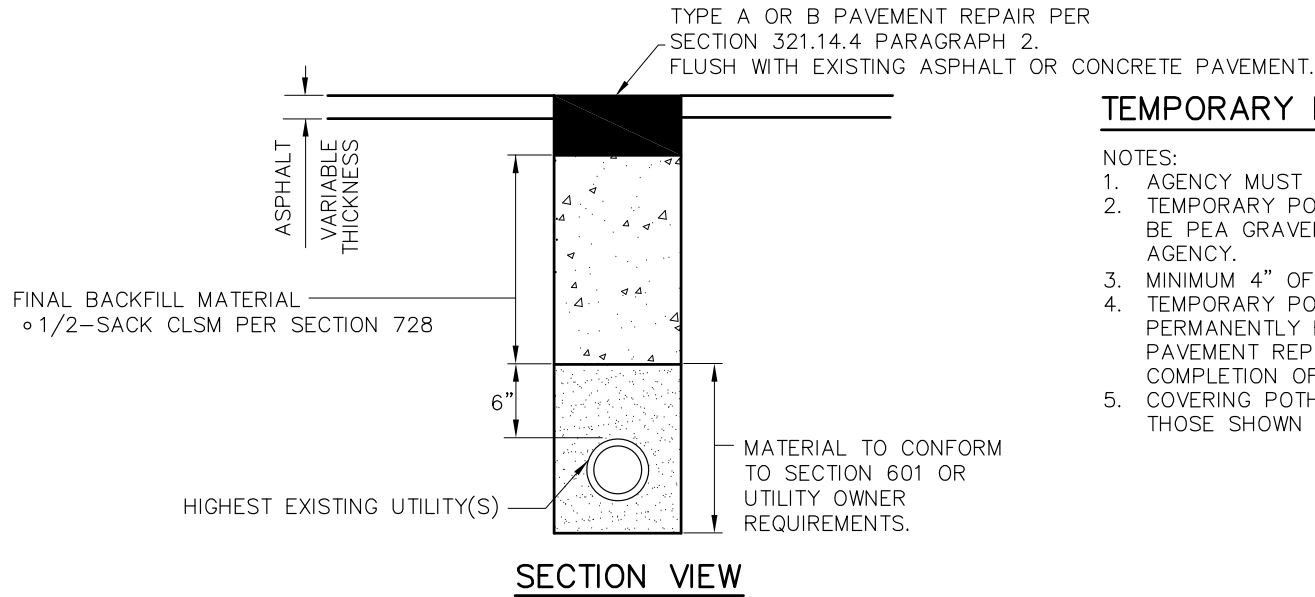
STANDARD TRENCH PLATING DETAIL

REVISED

01-01-1998

DETAIL NO.

211

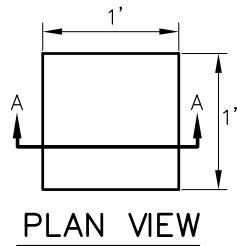


TEMPORARY POTHOLE REPAIRS

NOTES:

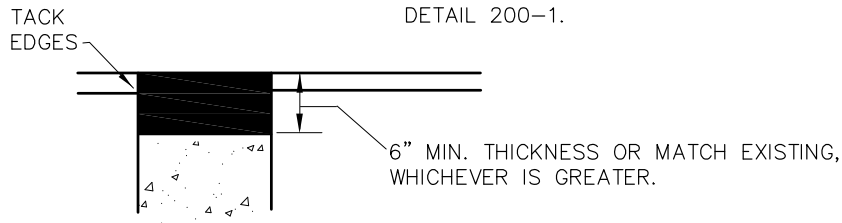
1. AGENCY MUST APPROVE A TEMPORARY POTHOLE.
2. TEMPORARY POTHOLE BACKFILL MATERIAL SHALL BE PEA GRAVEL UNLESS OTHERWISE SPECIFIED BY AGENCY.
3. MINIMUM 4" OF PATCHING MATERIAL REQUIRED.
4. TEMPORARY POTHOLE REPAIRS MUST BE PERMANENTLY REPAIRED WITH TYPE A OR TYPE B PAVEMENT REPAIR AS SHOWN BELOW BY COMPLETION OF PROJECT.
5. COVERING POTHOLES WITH PLATES SMALLER THAN THOSE SHOWN ON DETAIL 211 IS NOT ALLOWED.

TYPE A PAVEMENT REPAIR



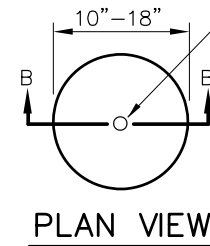
NOTES:

1. DIMENSIONS ARE NOMINAL.
2. EDGES SHALL BE CUT TO A NEAT VERTICAL FACE.
3. PLACE CLSM BACKFILL IN ACCORDANCE WITH SECTION 604.
4. PLACE AGENCY-APPROVED ASPHALT CONCRETE IN MAXIMUM 2" LIFTS.
5. REPAIR ALL CRACKS OR SAWCUT OVERCUT PER SECTION 337.
6. AGENCY MAY REQUIRE AN OPTIONAL 2'x2' MILLING OPERATION AND OFFSET JOINT REPAIR PER DETAIL 200-1.



SECTION A-A

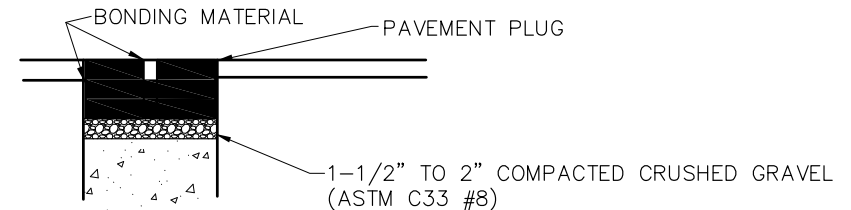
TYPE B PAVEMENT REPAIR



DRILLED/CORED PILOT HOLE IF NEEDED

NOTES:

1. CUT, REMOVE AND REPLACE PAVEMENT. PLUG IN ACCORDANCE WITH SECTION 355.
2. PLACE BACKFILL IN ACCORDANCE WITH SECTION 355.
3. BONDING MATERIAL SHALL BE AS SPECIFIED IN SECTION 708.



SECTION B-B

DETAIL NO.

212



STANDARD DETAIL
ENGLISH

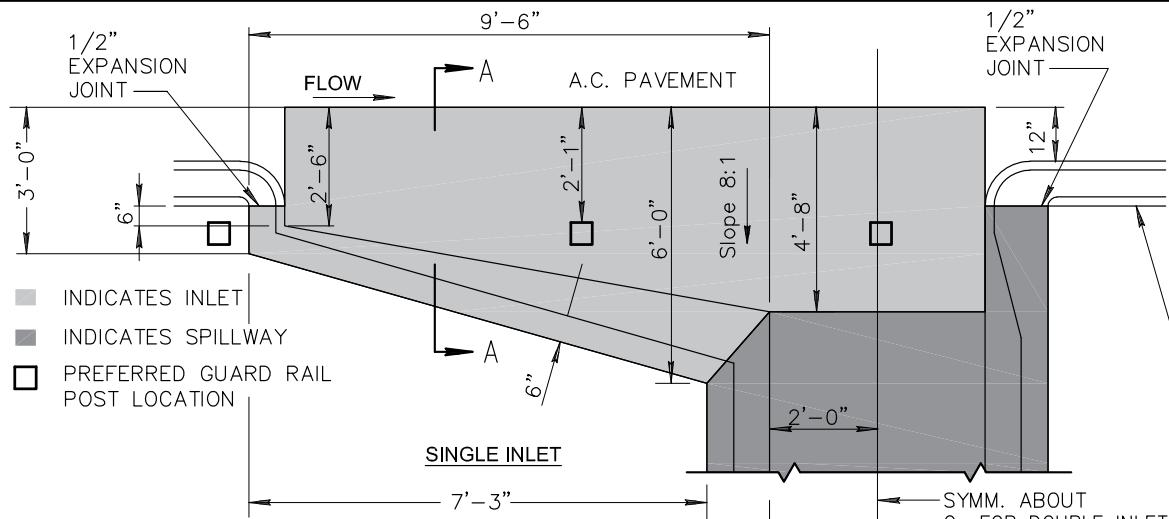
UTILITY POTHOLE REPAIR

REVISED

01-01-2024

DETAIL NO.

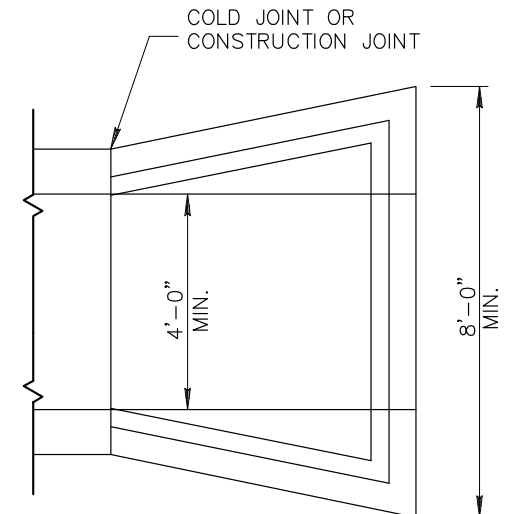
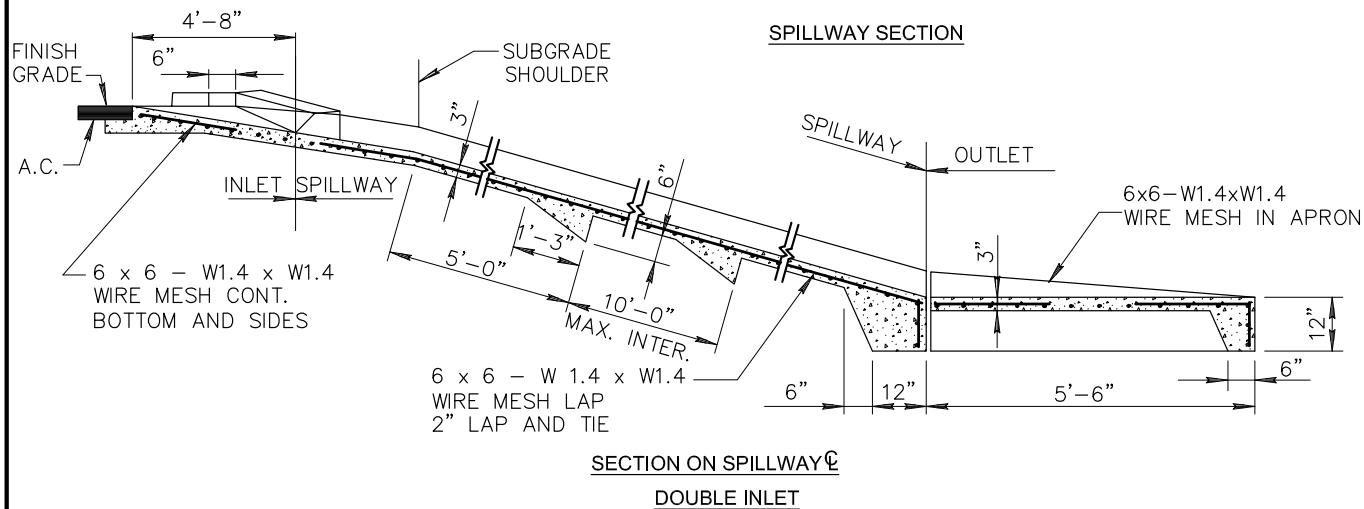
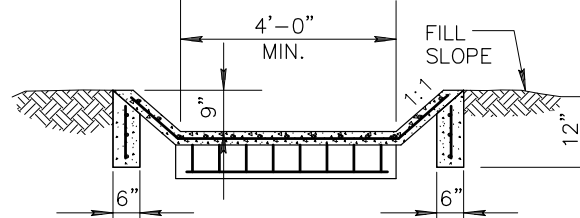
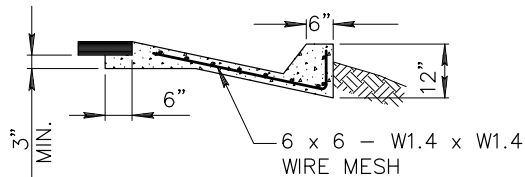
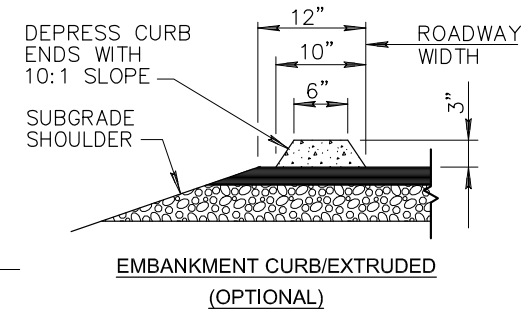
212



■ INDICATES INLET
 ■ INDICATES SPILLWAY
 □ PREFERRED GUARD RAIL POST LOCATION

NOTES:

1. WHERE ROCK IS ENCOUNTERED THE OUTLET MAY BE OMITTED.
2. ALL PORTIONS OF SPILLWAY TO BE TROWEL FINISHED.
3. CONCRETE FOR THE SPILLWAY INLET, SPILLWAY AND OUTLET SHALL BE CLASS 'B' PER SECT. 725.
4. WHEN THE OUTLET IS USED, THE WIRE MESH SHALL EXTEND THROUGH THE JOINT INTO THE OUTLET IN LIEU OF BENDING INTO THE KEY.



DETAIL NO.

550



STANDARD DETAIL
 ENGLISH

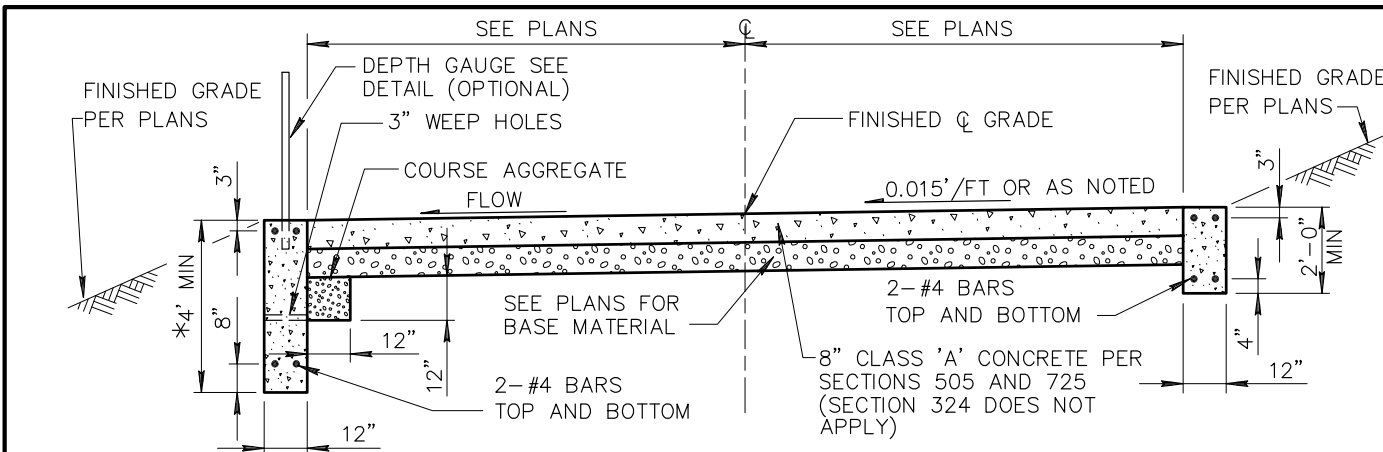
SPILLWAY INLET AND OUTLET

REVISED

01-01-2021

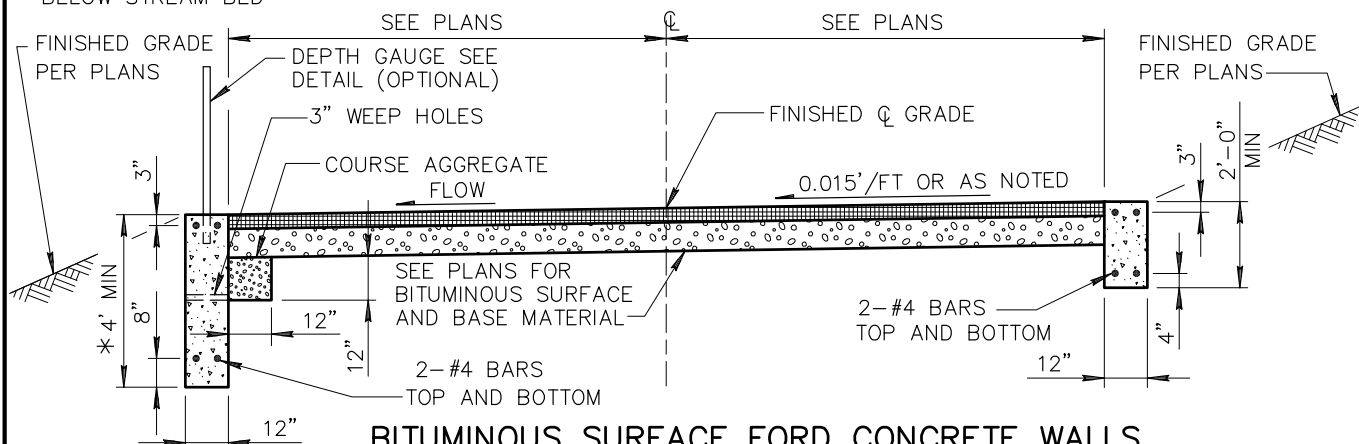
DETAIL NO.

550



CONCRETE SURFACE FORD CONCRETE WALLS

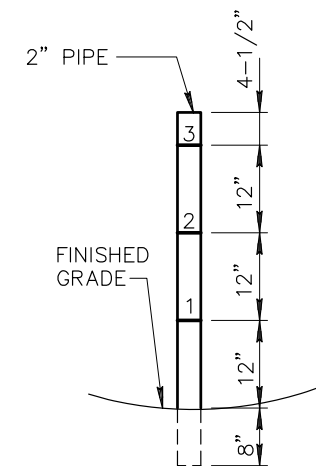
*MIN. DISTANCE BELOW STREAM BED



BITUMINOUS SURFACE FORD CONCRETE WALLS

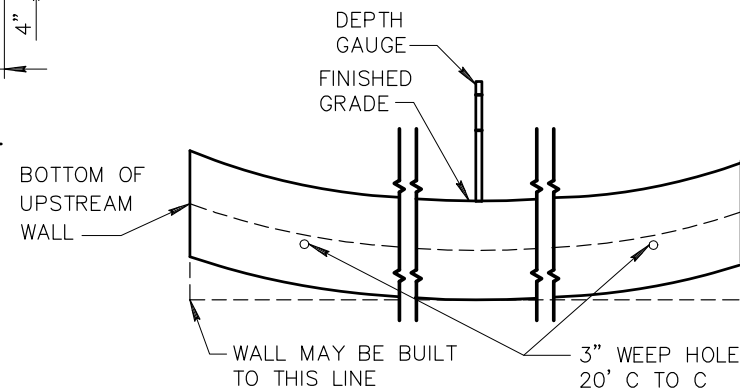
NOTES:

1. FORD WALLS SHALL BE CLASS 'A' CONCRETE PER SECT. 725.
2. DEPTH GAUGE SHALL BE PAINTED 2 COATS WHITE ENAMEL. NUMERALS AND MARKERS SHALL BE 1 COAT BLACK ENAMEL.
3. NUMBERS ON DEPTH GAUGE TO BE 2" HIGH.
4. HEIGHT OF DEPTH GAUGE PER PLANS.
5. REINFORCING BARS SHALL BE SET 3" CLEAR FROM SIDES OF CUT-OFF WALLS.
6. COURSE AGGREGATE AT WEEP HOLES SHALL BE ASTM C33 SIZE 57, ENCLOSED IN FILTER FABRIC (SECTION 796, CLASS B), AND EXTENDED Laterally A MINIMUM OF SIX-INCHES (6") ON EACH SIDE OF THE WEEP HOLE.



DEPTH GAUGE DETAIL

(OPTION OF THE CONTRACTING AGENCY)



ELEVATION LOOKING UPSTREAM

DETAIL NO.

552



STANDARD DETAIL
ENGLISH

FORD CROSSING AND CUT-OFF WALLS

REVISED

01-01-2024

DETAIL NO.

552